40UV,UH050-200 Unit Ventilators with Product Integrated Control (PIC)

Installation, Start-Up and Service Instructions

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SAFETY CONSIDERATIONS

Installation and servicing of this unit can be hazardous due to system pressure, electrical components and equipment location (such as a ceiling or elevated structure). Untrained personnel can perform the basic maintenance functions of replacing filters. Only trained and qualified service personnel should perform all other operations.

When installing this unit, observe precautions in the literature, tags and labels attached to the equipment, and any other safety precautions that may apply.

- Follow all safety codes.
- Wear safety glasses and work gloves.
- Use care in handling and installing this accessory.
- Use quenching cloth for all brazing operations.
- Have fire extinguisher available for all brazing operations.

⚠ WARNING

Before performing service or maintenance operations, turn off main power switch to the unit. Electrical shock could cause personal injury.

INTRODUCTION

This document contains general installation instructions for the 40UV,UH unit ventilators and information and troubleshooting of the Product Integrated Control (PIC) option.

See submittal drawings for unit configurations, dimensions, clearances, and pipe connections. Refer to unit wiring label for all electrical connections; follow NEC (National Electrical Code) and local codes.

PREINSTALLATION

Unpack and Inspect Units — Remove shipping wraps from all units. Check the shipment against shipping order. *If shipment is damaged or incomplete, file claim with transportation company and advise Carrier immediately.*

Protect Units From Damage — To maintain warranty, protect units against adverse weather, theft, vandalism, and debris on jobsite. Do not allow foreign material to fall into drain pan. Prevent dust and debris from being deposited on motor and fan wheels.

If the equipment is stored for any length of time before installation, it should remain in its shipping container in a clean, dry, and climate controlled area.

Prepare Jobsite for Unit Installation — To save time and to reduce the possibility of costly errors, set up a complete sample installation in a typical room at jobsite. Check all critical dimensions such as pipe, wire, and duct connection requirements. Refer to job drawings and product dimension drawings as required. Instruct all trades in their part of the installation.

Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.

Identify and Prepare Units

1. Be sure power requirements match available power source. Refer to the unit nameplate and wiring diagram.
2. Remove front (40UV) or bottom (40UH) access panels from the unit. Retain the 5/32-in. socket head fasteners and panels for reinstallation later.
3. Rotate the fan shaft by hand to ensure that fans are unrestricted and can rotate freely. Check for shipping damage and fan obstructions.

PHYSICAL DATA

Component weight data of 40UV,UH units is provided in Table 1.

INSTALLATION

⚠ CAUTION

Units must be installed level and plumb. Failure to do so may result in excessive vibration and/or premature failure.

Placing Vertical Units in Position

1. Select the unit location; ensure that service clearance is provided. Allow enough grille clearance to maintain unrestricted airflow. See submittal drawings and Fig. 1 and 2 for dimensions.
2. Make sure wall behind unit is smooth and plumb; if necessary, install furring strips on walls with irregular surfaces or mullions. Furring strips must be positioned behind mounting holes in unit. Fasteners, furring strips, and other seals (if required) must be field supplied.
3. Remove all wall and floor moldings from behind the unit.
4. Move unit into position. Unit must be snug against wall and furring strips.
5. Adjust unit leveling legs so unit is level. Unit must be level for proper operation and condensate drainage.
6. Using field-supplied fasteners, reach into unit and attach unit to the wall using the 3/4 in. mounting holes in the back panel.
7. Protect the unit from jobsite debris. Do not allow foreign material to fall into drain pan. Prevent dust and debris from being deposited on motor or fan.

Placing Horizontal Units in Position

1. Select the unit location; ensure that service clearance is provided. Allow enough grille clearance to maintain unrestricted airflow. Make sure that ceiling is able to support the weight of the unit. See Fig. 3-5 for nominal unit weight. See submittal drawings and Fig. 3-5 for dimensions.

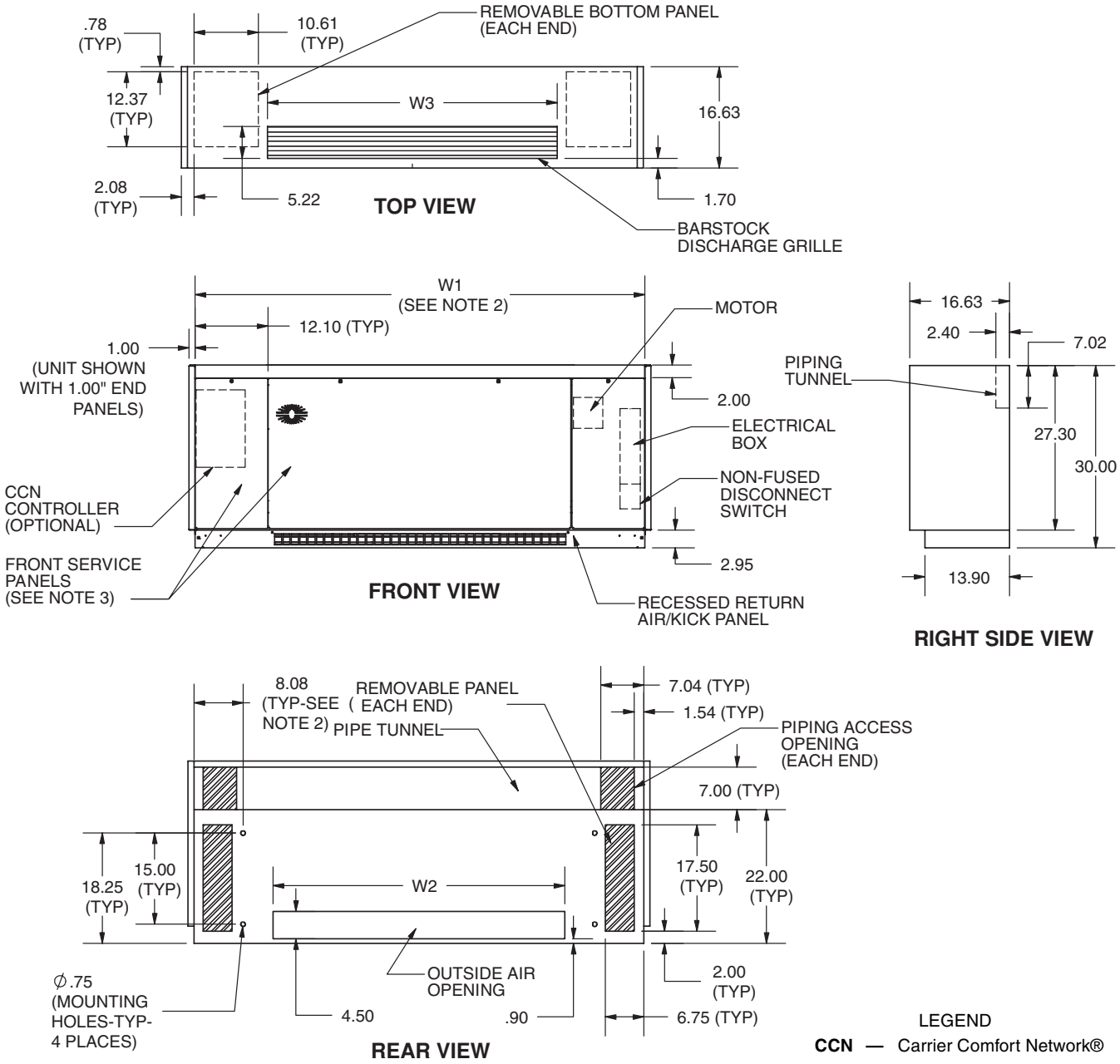
   NOTE: See page 23 for additional requirements for units ducted to multiple openings.
2. Ensure that bottom panels have been removed from unit. When unit is lifted, access to the 3/4 in. mounting holes is through the bottom of the unit. Hanger rods and fasteners and other required hardware must be field supplied.
3. Using a forklift or other mechanical lifting device, raise the unit to the mounting position. If forklift or other lifting device is likely to contact a painted wall surface, protect the surface as necessary.
4. Use rods and fasteners to suspend the unit at the mounting holes on the top of the unit. The unit must be suspended at the 3/4 in. mounting holes; do not use any other locations.
5. If desired, install field-supplied vibration isolators. Adjust isolators so unit is uniformly suspended and pitched.
6. To ensure proper drainage and operation, ensure unit is level and tighten all fasteners. DO NOT mount the unit on a slope. Pitch of horizontal suspended units can change after coil is filled; recheck after filling coil.
7. Protect the unit from jobsite debris. Do not allow foreign material to fall into drain pan. Prevent dust and debris from being deposited on motor or fan.

Table 1 — Physical Data

UNIT 40UV,UH	050*	075	100	125	150	200†
NOMINAL AIRFLOW (Cfm)	500	750	1000	1250	1500	2000
FANS						
Quantity	1	2	3	4	5	5
Diameter (in.)	8.32	8.32	8.32	8.32	8.32	9.5
Width (in.)	8	8	8	8	8	6
FILTERS						
Nominal Size (in.) (1 in. thick)	9 3/4 x 24 1/4	9 3/4 x 36 1/4	9 3/4 x 48 1/4	9 3/4 x 60 1/4	9 3/4 x 72 1/4	9 3/4 x 72 1/4
Nominal Size (in.) (2 in. thick)	9 x 24 1/4	9 x 36 1/4	9 x 48 1/4	9 x 60 1/4	9 x 72 1/4	9 x 72 1/4
Quantity	1	1	1	1	1	1
40UV SHIPPING WEIGHT** (Approx lb)						
16 5/8 in. Deep Unit	330	400	480	590	660	—
21 7/8 in. Deep Unit	340	410	490	605	675	—
40UH SHIPPING WEIGHT** (Approx lb)						
30 1/2 in. Deep Unit	—	420	500	620	690	—
36 in. Deep Unit	—	500	600	740	830	—
40 in. Deep Unit	—	530	640	790	880	1020
44 in. Deep Unit	—	—	—	—	—	1050
40UV INSTALLED WEIGHT** (Approx lb)						
16 5/8 in. Deep Unit	315	380	460	570	640	—
21 7/8 in. Deep Unit	325	390	470	595	655	—
40UH INSTALLED WEIGHT** (Approx lb)						
30 1/2 in. Deep Unit	—	405	480	600	670	—
36 in. Deep Unit	—	485	580	720	810	—
40 in. Deep Unit	—	515	620	770	860	1000
44 in. Deep Unit	—	—	—	—	—	1030
COIL WATER WEIGHT (Approx lb per row of coil)	1.0	1.5	2.0	2.4	2.7	2.7
COIL CONNECTIONS (in. OD)		Return			Supply	
Water Coils with 1 to 5 Rows		7/8			7/8	
Steam Coils (All Units)		7/8			1 1/8	
DX Coils		Suction 7/8			Liquid 3/8	

LEGEND
DX — Direct Expansion

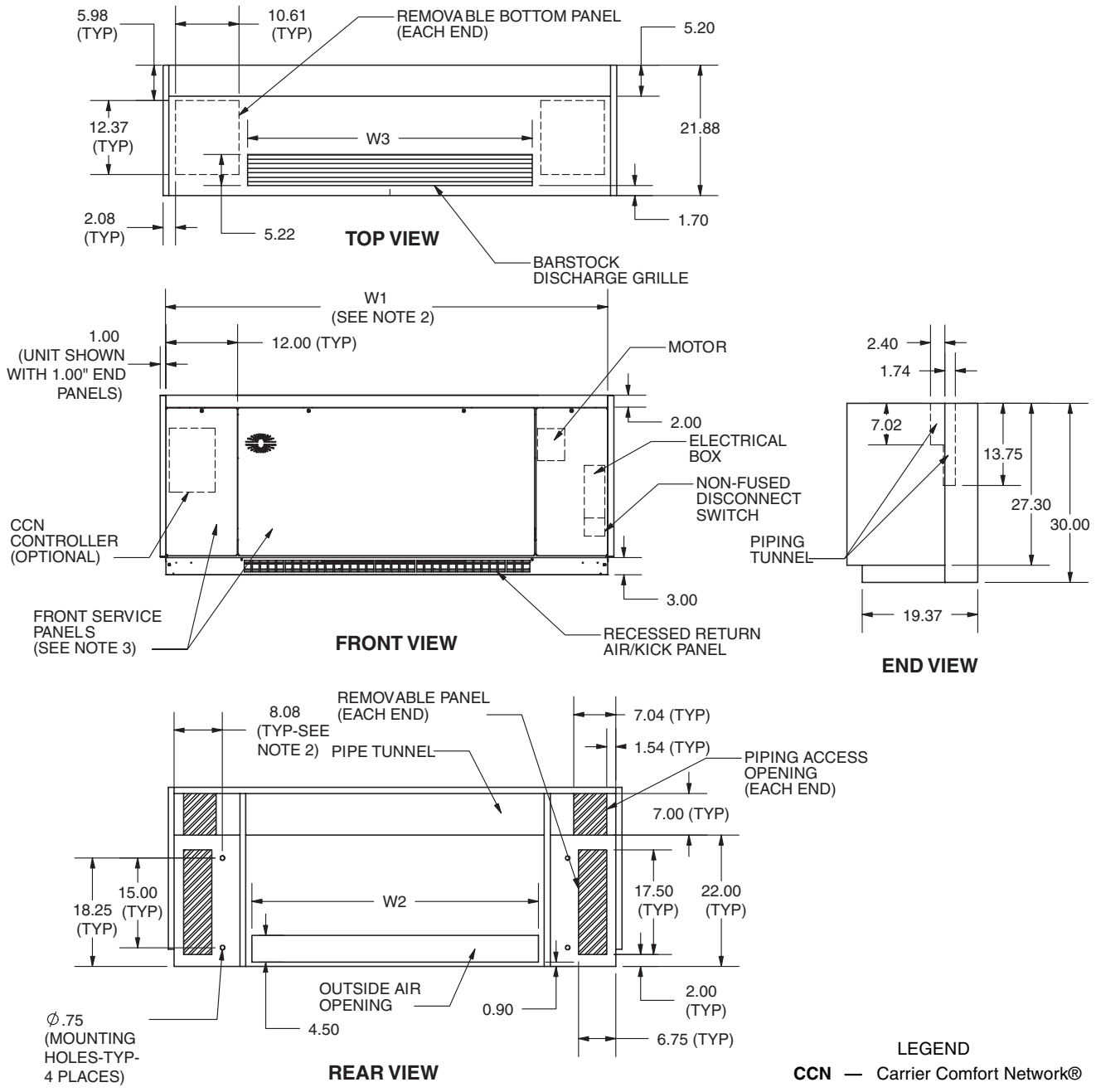
*40UV only.
†40UH 40 and 44 in. deep units only.
**Weight based on damper-controlled unit with 5-row coil and factory-installed controls.



UNIT 40UV	AIRFLOW (cfm)	DIMENSIONS (in.)			APPROXIMATE SHIPPING WEIGHT (lb)	APPROXIMATE INSTALLED WEIGHT (lb)
		W1	W2	W3		
050	500	50	24	16.60	330	315
075	750	62	36	31.67	400	380
100	1000	74	48	46.74	480	460
125	1250	86	60	61.81	590	570
150	1500	98	72	78.47	660	640

NOTES:
1. All dimensions are in inches.
2. Dimension does not include end panels.
3. Three front panels provided for service access.
4. Motor and electrical power input box on right side of unit. Box includes fan speed switch, On/Off switch and non-fused disconnect switch.
5. Connection hand is determined by facing discharge of unit.

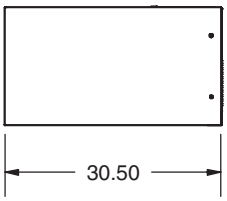
Fig. 1 — 40UV Dimensions — $16^{5}/_{8}$-in. Deep Units (Standard)



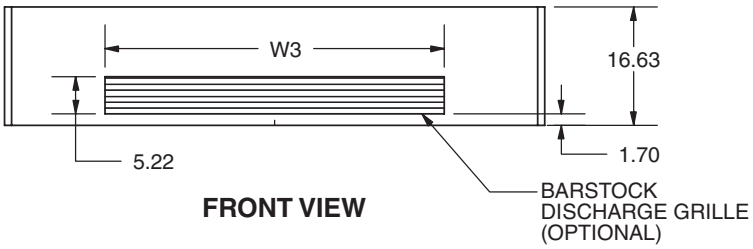
UNIT 40UV	AIRFLOW (cfm)	DIMENSIONS (in.)			APPROXIMATE SHIPPING WEIGHT (lb)	APPROXIMATE INSTALLED WEIGHT (lb)
		W1	W2	W3		
050	500	50	24	16.60	340	325
075	750	62	36	31.67	410	390
100	1000	74	48	46.74	490	470
125	1250	86	60	61.81	605	595
150	1500	98	72	78.47	675	655

NOTES:
1. All dimensions are in inches.
2. Dimension does not include end panels.
3. Three front panels provided for service access.
4. Motor and electrical power input box on right side of unit. Box includes fan speed switch, On/Off switch and non-fused disconnect switch.
5. Connection hand is determined by facing discharge of unit.

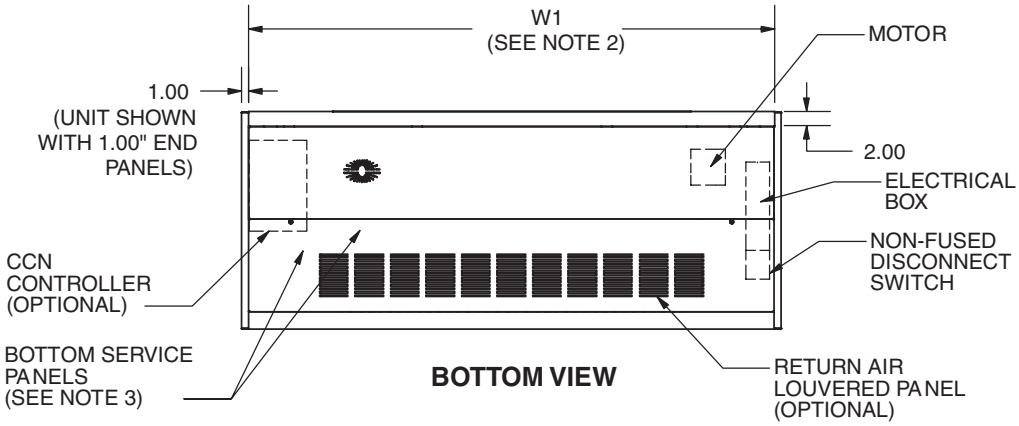
Fig. 2 — 40UV Dimensions — 21 7/8-in. Deep Units (With Piping Chase)



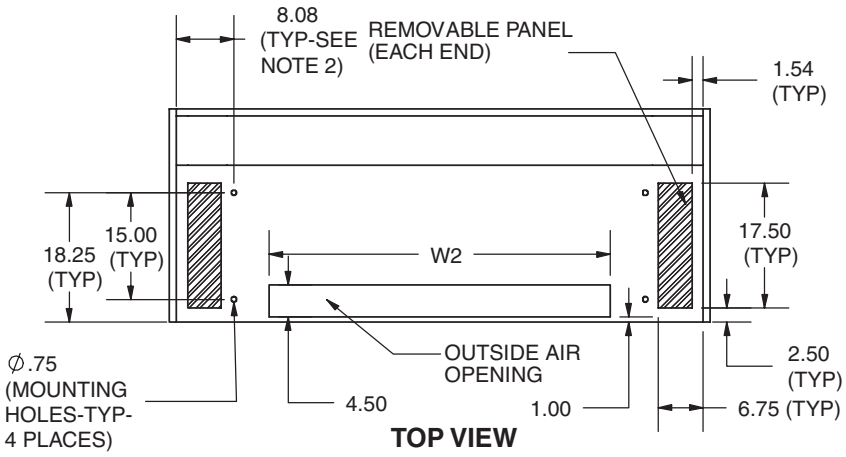
LEFT SIDE VIEW



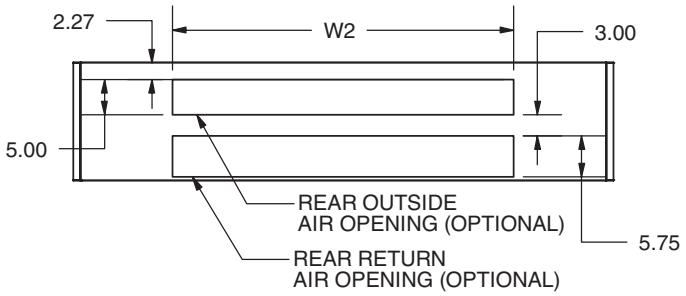
FRONT VIEW



BOTTOM VIEW



TOP VIEW



REAR VIEW

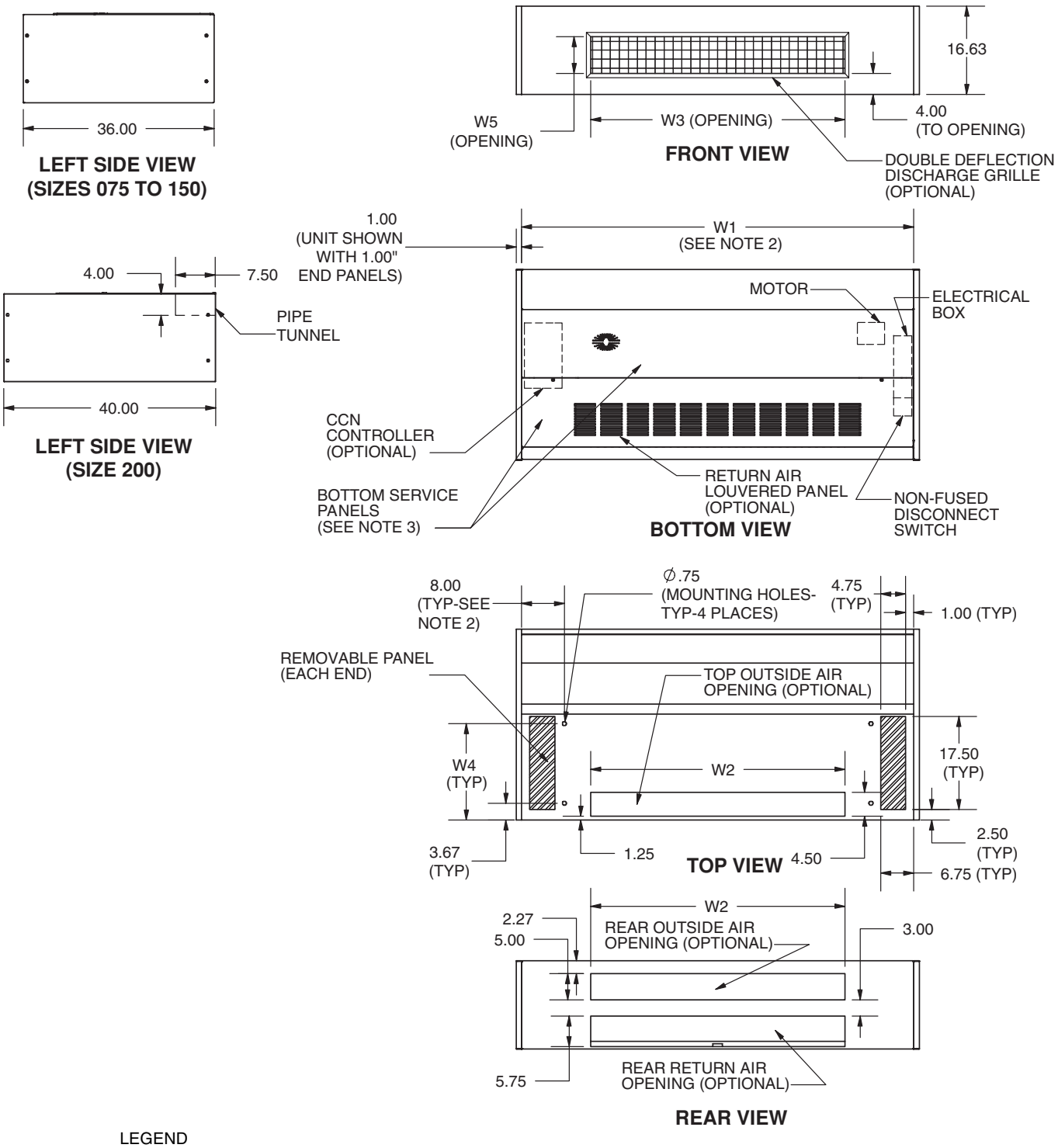
LEGEND

CCN — Carrier Comfort Network®

UNIT 40UH	AIRFLOW (cfm)	DIMENSIONS (in.)			APPROXIMATE SHIPPING WEIGHT (lb)	APPROXIMATE INSTALLED WEIGHT (lb)
		W1	W2	W3		
075	750	62	36	31.67	420	405
100	1000	74	48	46.74	500	480
125	1250	86	60	61.81	620	600
150	1500	98	72	78.47	690	670

NOTES:
1. All dimensions are in inches.
2. Dimension does not include end panels.
3. Two bottom panels provided for service access.
4. Motor and electrical power input box on right side of unit. Box includes fan speed switch, On/Off switch and non-fused disconnect switch.
5. Connection hand is determined by facing discharge of unit.

Fig. 3 — 40UH Dimensions — 30 1/2-in. Deep Units



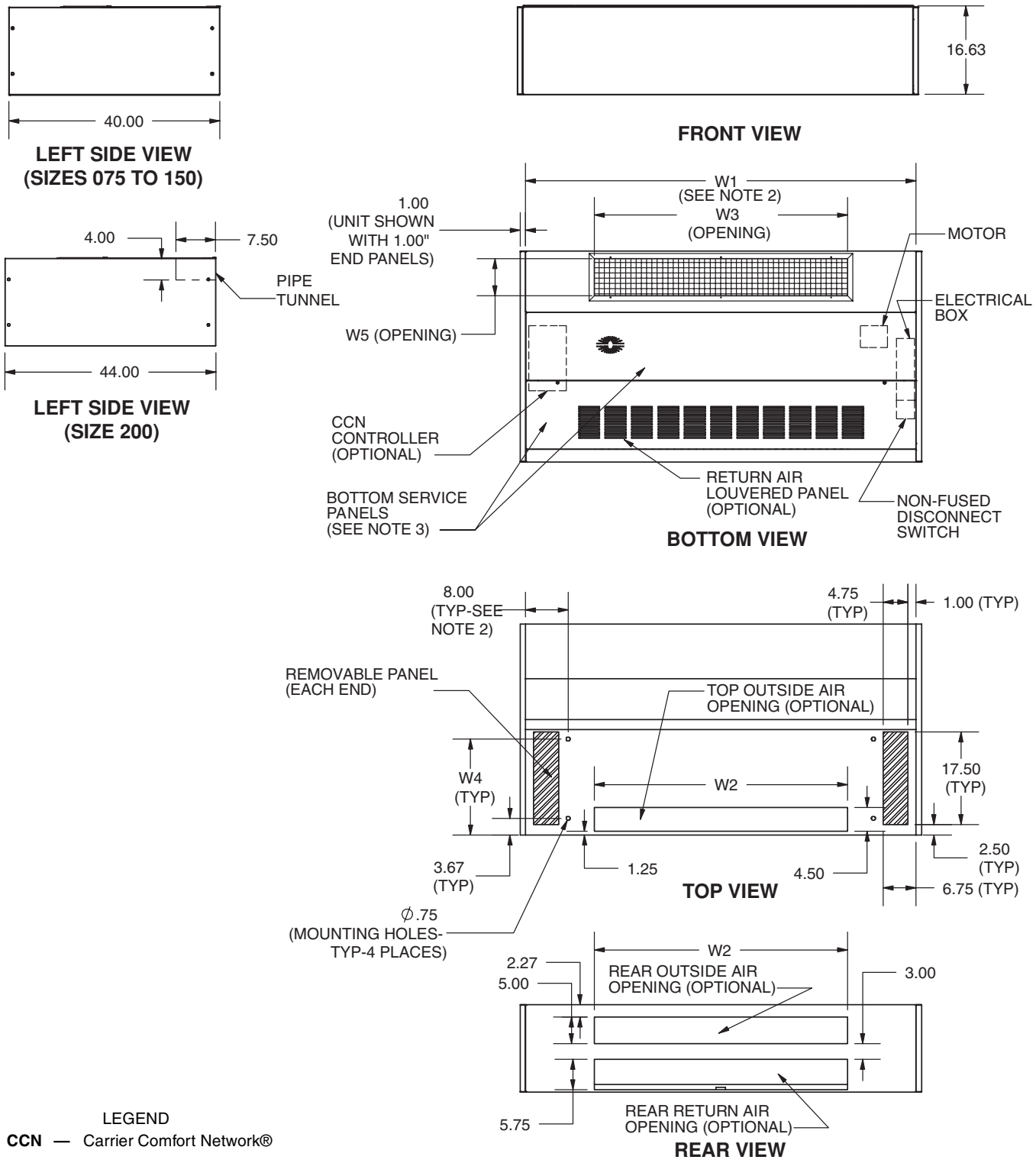
LEGEND

CCN — Carrier Comfort Network®

UNIT 40UH	AIRFLOW (cfm)	DEPTH (in.)	DIMENSIONS (in.)					APPROXIMATE SHIPPING WEIGHT (lb)	APPROXIMATE INSTALLED WEIGHT (lb)
			W1	W2	W3	W4	W5		
075	750	36	62	36	36	18.67	7.00	500	485
100	1000	36	74	48	48	18.67	7.00	600	580
125	1250	36	86	60	60	18.67	7.00	740	720
150	1500	36	98	72	72	18.67	7.00	830	810
200	2000	40	98	72	72	26.92	10.00	1020	1000

NOTES:
1. All dimensions are in inches.
2. Dimension does not include end panels.
3. Two bottom panels provided for service access.
4. Motor and electrical power input box on right side of unit. Box includes fan speed switch, On/Off switch and non-fused disconnect switch.
5. Connection hand is determined by facing discharge of unit.

Fig. 4 — 40UH Dimensions — Front Discharge Units



LEGEND

CCN — Carrier Comfort Network®

UNIT 40UH	AIRFLOW (cfm)	DEPTH (in.)	DIMENSIONS (in.)					APPROXIMATE SHIPPING WEIGHT (lb)	APPROXIMATE INSTALLED WEIGHT (lb)
			W1	W2	W3	W4	W5		
075	750	40	62	36	36	18.67	7.00	530	515
100	1000	40	74	48	48	18.67	7.00	640	620
125	1250	40	86	60	60	18.67	7.00	790	770
150	1500	40	98	72	72	18.67	7.00	880	860
200	2000	44	98	72	72	26.92	10.00	1050	1030

NOTES:
1. All dimensions are in inches.
2. Dimension does not include end panels.
3. Two bottom panels provided for service access.
4. Motor and electrical power input box on right side of unit. Box includes fan speed switch, On/Off switch and non-fused disconnect switch.
5. Connection hand is determined by facing discharge of unit.

Fig. 5 — 40UH Dimensions — Down Discharge Plenum

Make Piping Connections — Access to piping is available through the access panels at the front, top, or end of the vertical unit (horizontal access from bottom or side). Route piping through the pipe tunnel or the unit's back panel or floor panel. Metal blank-off panels must be trimmed to complete piping installation. All piping connections must be performed by qualified personnel in accordance with local and national codes.

DRAIN CONNECTIONS — Condensate drain connections are located on each end of the drain pan near the bottom of the unit. Condensate drain line must be $^3/_4$ in. copper tubing, galvanized pipe, PVC or similar plastic pipe. Install drain line in accordance with all applicable codes. Insulate the drain line to prevent sweating. See Fig. 6 for typical drain trap construction.

Units with cooling coils require traps to prevent air from entering the condensate fitting and preventing proper drainage. Drain must flow downhill from the unit a minimum of $^1/_8$ in. per ft. Drain must be free and clear at all times.

⚠ CAUTION

Insulate drain lines to prevent condensate. Care must be taken to avoid interference with control panel on left side drain.

WATER SUPPLY/RETURN CONNECTIONS — Install piping in accordance with all applicable codes. All piping must be supported separately from coils.

Water supply must be connected so that entering water is on leaving-air side of coil. See the connection labels on the unit to locate the inlet. Coils must be adequately vented to prevent air binding. Be sure valves are in proper operating position and are easily accessible for adjustment.

If coil and valve package connections will be made with a solder joint, care should be taken to ensure that components in the valve package are not subjected to high temperatures which may damage seals or other materials. Many 2-position electric control valves are provided with a manual operating lever. This lever should be in the OPEN position during all soldering operations.

If coil connection is made with a union, the coil side of the union must be prevented from turning (it must be backed up) during tightening. *Do not overtighten! Overtightening will distort (egg shape) the union seal surface and destroy the union.*

NOTE: A freezestat is factory-installed when a hot water/steam coil is installed.

STEAM CONNECTIONS — On units with steam heating coils, the maximum steam pressure applied to the unit should never exceed 10 psig (operating pressure 6 psig).

DIRECT EXPANSION REFRIGERANT PIPING — Use the condensing unit manufacturer's recommended line sizes and requirements. Perform leak test using nitrogen. Evacuate and charge per recommended heating, ventilation, and air conditioning (HVAC) procedures and all applicable codes. Insulate suction line after leak test up to the coil section end plate for correct operation and to eliminate sweating. Use refrigerant-grade copper lines only. The unit is **NOT** to be applied as a heat pump.

See Fig. 7 for refrigerant piping connections with recommended locations for the thermostatic expansion valve (TXV) and sensing bulb.

HYDRONIC COIL PIPING — When all joints are complete, perform hydrostatic test for leaks. Vent all coils at this time. Check interior unit piping for signs of leakage from shipping damage or mishandling. If leaks are found, notify a Carrier representative before initiating any repairs. Release trapped air from system (refer to Make Final Preparations section).

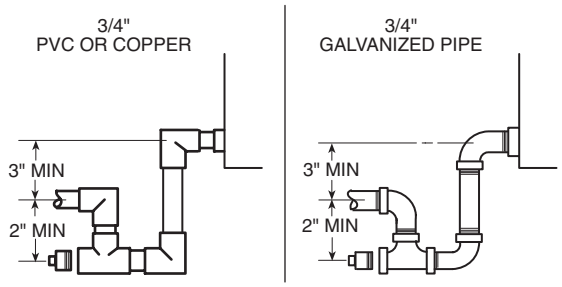
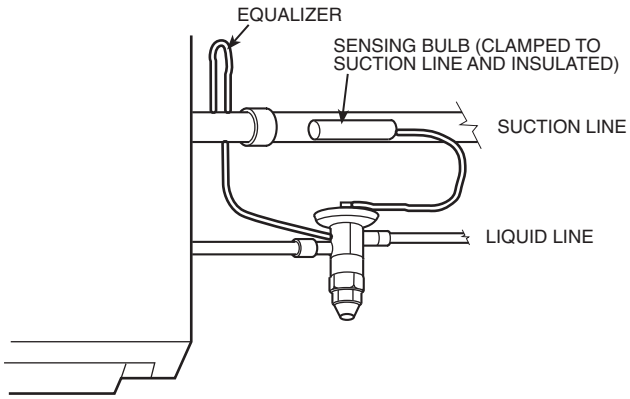


Fig. 6 — Typical Condensate Drain Trap Construction



NOTE: Follow TXV manufacturer's instructions.

Fig. 7 — Typical TXV (Thermostatic Expansion Valve) Installation

⚠ CAUTION

All water coils must be protected from freezing after initial filling with water. Even if system is drained, unit coils may still have enough remaining water to cause damage when exposed to temperatures below freezing.

Following the hydrostatic test, insulate all piping up to the coil section end plate to prevent sweating.

To ensure compliance with building codes, restore the structure's original fire resistance rating by sealing all holes with material carrying the same fire rating as the structure.

Make Electrical Connections — Refer to unit serial plate for required supply voltage, fan and heater amperage, and required circuit ampacities. Refer to unit wiring diagram for unit and field wiring. See Tables 2-4 for electrical data.

All input power wiring connections are accessed through the electrical panel on front right-hand side of the unit. Use the openings that are for the piping connections. See the dimensional drawings Fig. 1-5 for electrical box connections.

The fan motor should never be controlled by any wiring or device other than the factory-supplied switch or thermostat/switch combination unless prior factory authorization is obtained. Fan motor may be temporarily wired for use during construction only with prior factory approval and only in strict accordance with the instructions issued at that time.

All electrical connections should be made by qualified personnel and be in accordance with governing codes and ordinances. Any modification of unit wiring without factory authorization will invalidate all factory warranties and nullify any agency listings. See Fig. 8A and 8B for typical wiring connections for basic unit with CCN (Carrier Comfort Network®) controls.

Actuators (Field-Supplied) — Field-supplied actuators must be mounted on $^1/_2$ in. diameter damper shafts.

Table 2 — Electric Heater Data for Units with PSC Motor

UNIT	HP	NOMINAL V/Ph/Hz	NUMBER OF ELEMENTS	FLA	LAT (F)	MCA	MOCP	TOTAL CAPACITY (kW)
40UV050 (at 500 Cfm)	1/5	208/1/60	3	17.2	90	21.5	25	3.2
			4	22.2	97	27.8	30	4.2
			5	27.3	104	34.1	35	5.3
			6	32.3	110	40.4	45	6.3
		240/1/60	3	19.5	97	24.4	25	4.2
			4	25.3	106	31.7	35	5.6
			5	31.2	115	39.0	40	7.0
			6	37.0	124	46.3	50	8.4
		277/1/60	3	16.8	97	21.0	25	4.2
			4	21.8	106	27.3	30	5.6
			5	26.9	115	33.6	35	7.0
			6	31.9	124	39.9	40	8.4
		208/3/60	3	10.8	90	13.5	15	3.2
			4	15.8	97	19.8	20	4.2
			5	19.5	104	24.4	25	5.3
			6	19.5	110	24.4	25	6.3
		240/3/60	3	12.1	97	15.1	20	4.2
			4	17.9	106	22.4	25	5.6
			5	22.2	115	27.8	30	7.0
			6	22.2	124	27.8	30	8.4
		460/3/60	3	6.0	97	7.5	15	4.2
			4	8.9	106	11.1	15	5.6
			5	11.0	115	13.8	15	7.0
			6	11.0	124	13.8	15	8.4

LEGEND

DX — Direct Expansion
FLA — Full Load Amps
LAT — Leaving-Air Temperature at 70 F Entering-Air Temperature
MCA — Unit Minimum Circuit Ampacity
MOCP — Maximum Overcurrent Protection (Maximum Fuse Size or Circuit Breaker Amps)
PSC — Permanent Split Capacitor

NOTES:
1. LAT (Leaving Air Temperature) (F) is measured at nominal cfm.
2. Water and DX coil used on electric heat units have left-hand coil connections.
3. Electric heat is available in the reheat position only and connections are on the right side.
4. Face and bypass units are available with 3 heating elements only.

Table 2 — Electric Heater Data for Units with PSC Motor (cont)

UNIT	HP	NOMINAL V/Ph/Hz	NUMBER OF ELEMENTS	FLA	LAT (F)	MCA	MOCP	TOTAL CAPACITY (kW)
40UV,UH075 (at 750 Cfm)	1/5	208/1/60	3	23.7	89	29.6	30	4.5
			4	30.9	96	38.6	40	6.0
			5	38.1	102	47.6	50	7.5
			6	45.3	108	56.7	60	9.0
		240/1/60	3	27.0	96	33.8	35	6.0
			4	35.3	104	44.2	45	8.0
			5	43.7	113	54.6	60	10.0
			6	52.0	121	65.0	70	12.0
		277/1/60	3	23.3	96	29.1	30	6.0
			4	30.5	104	38.1	40	8.0
			5	37.7	113	47.1	50	10.0
			6	44.9	121	56.2	60	12.0
		208/3/60	3	14.5	89	18.2	20	4.5
			4	21.7	96	27.2	30	6.0
			5	27.0	102	33.8	35	7.5
			6	27.0	108	33.8	35	9.0
		240/3/60	3	16.5	96	20.6	25	6.0
			4	24.8	104	31.0	35	8.0
			5	30.9	113	38.6	40	10.0
			6	30.9	121	38.6	40	12.0
		460/3/60	3	8.2	96	10.2	15	6.0
			4	12.3	104	15.4	20	8.0
			5	15.4	113	19.2	20	10.0
			6	15.4	121	19.2	20	12.0

LEGEND

DX — Direct Expansion
FLA — Full Load Amps
LAT — Leaving-Air Temperature at 70 F Entering-Air Temperature
MCA — Unit Minimum Circuit Ampacity
MOCP — Maximum Overcurrent Protection (Maximum Fuse Size or Circuit Breaker Amps)
PSC — Permanent Split Capacitor

NOTES:
1. LAT (Leaving Air Temperature) (F) is measured at nominal cfm.
2. Water and DX coil used on electric heat units have left-hand coil connections.
3. Electric heat is available in the reheat position only and connections are on the right side.
4. Face and bypass units are available with 3 heating elements only.

Table 2 — Electric Heater Data for Units with PSC Motor (cont)

UNIT	HP	NOMINAL V/Ph/Hz	NUMBER OF ELEMENTS	FLA	LAT (F)	MCA	MOCP	TOTAL CAPACITY (kW)
40UV,UH100 (at 1000 Cfm)	1/5	208/1/60	3	30.9	89	38.6	40	6.0
			4	40.5	95	50.7	60	8.0
			5	50.2	102	62.7	70	10.0
			6	59.8	108	74.7	80	11.9
		240/1/60	3	35.3	96	44.2	45	8.0
			4	46.5	104	58.1	60	10.7
			5	57.6	112	72.0	80	13.3
			6	68.7	121	85.8	90	16.0
		277/1/60	3	30.5	96	38.1	40	8.0
			4	40.1	104	50.1	60	10.7
			5	49.7	112	62.2	70	13.3
			6	59.4	121	74.2	80	16.0
		208/3/60	3	18.7	89	23.4	25	6.0
			4	28.3	95	35.4	40	8.0
			5	35.4	102	44.3	45	10.0
			6	35.4	108	44.3	45	11.9
		240/3/60	3	21.3	96	26.6	30	8.0
			4	32.4	104	40.5	45	10.7
			5	40.5	112	50.7	60	13.3
			6	40.5	121	50.7	60	16.0
		460/3/60	3	10.6	96	13.2	15	8.0
			4	16.1	104	20.1	25	10.7
			5	20.2	112	25.2	30	13.3
			6	20.2	121	25.2	30	16.0

LEGEND

DX — Direct Expansion
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MCA — Unit Minimum Circuit Ampacity
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PSC — Permanent Split Capacitor

NOTES:
1. LAT (Leaving Air Temperature) (F) is measured at nominal cfm.
2. Water and DX coil used on electric heat units have left-hand coil connections.
3. Electric heat is available in the reheat position only and connections are on the right side.
4. Face and bypass units are available with 3 heating elements only.

Table 2 — Electric Heater Data for Units with PSC Motor (cont)

UNIT	HP	NOMINAL V/Ph/Hz	NUMBER OF ELEMENTS	FLA	LAT (F)	MCA	MOCP	TOTAL CAPACITY (kW)
40UV,UH125 (at 1250 Cfm)	1/5	208/1/60	3	38.1	89	47.6	50	7.5
			4	50.1	96	62.7	70	10.0
			5	62.2	102	77.7	80	12.5
			6	74.2	108	92.8	100	15.0
		240/1/60	3	43.7	96	54.6	60	10.0
			4	57.6	104	71.9	80	13.3
			5	71.4	113	89.3	90	16.7
			6*	85.3	121	106.7	110	20.0
		277/1/60	3	37.7	96	47.1	50	10.0
			4	49.7	104	62.2	70	13.3
			5	61.8	113	77.2	80	16.7
			6	73.8	121	92.2	100	20.0
		208/3/60	3	22.9	89	28.6	30	7.5
			4	34.9	96	43.6	45	10.0
			5	43.7	102	54.7	60	12.5
			6	43.7	108	54.7	60	15.0
		240/3/60	3	26.1	96	32.6	35	10.0
			4	40.0	104	50.0	50	13.3
			5	50.2	113	62.7	70	16.7
			6	50.2	121	62.7	70	20.0
		460/3/60	3	13.0	96	16.2	20	10.0
			4	19.9	104	24.9	25	13.3
			5	25.0	113	31.3	35	16.7
			6	25.0	121	31.3	35	20.0

LEGEND

DX — Direct Expansion
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*Left hand coil connections only.

NOTES:
1. LAT (Leaving Air Temperature) (F) is measured at nominal cfm.
2. Water and DX coil used on electric heat units have left-hand coil connections.
3. Electric heat is available in the reheat position only and connections are on the right side.
4. Face and bypass units are available with 3 heating elements only.

Table 2 — Electric Heater Data for Units with PSC Motor (cont)

UNIT	HP	NOMINAL V/Ph/Hz	NUMBER OF ELEMENTS	FLA	LAT (F)	MCA	MOCP	TOTAL CAPACITY (kW)
40UV,UH150 (at 1500 Cfm)	1/5	208/1/60	3	45.3	89	56.7	60	9.0
			4	59.8	96	74.7	80	12.0
			5	74.2	102	92.8	100	15.0
			6*	88.7	108	110.8	125	18.0
		240/1/60	3	52.0	96	65.0	70	12.0
			4	68.7	104	85.8	90	16.0
			5*	85.3	113	106.7	110	20.0
			6	—	—	—	—	—
		277/1/60	3	44.9	96	56.2	60	12.0
			4	59.4	104	74.2	80	16.0
			5	73.8	113	92.3	100	20.0
			6	—	—	—	—	—
		208/3/60	3	27.0	89	33.8	35	9.0
			4	41.5	96	51.9	60	12.0
			5	52.1	102	65.1	70	15.0
			6	52.1	108	65.1	70	18.0
		240/3/60	3	30.9	96	38.6	40	12.0
			4	47.6	104	59.5	60	16.0
			5	59.8	113	74.8	80	20.0
			6	59.8	121	74.8	80	24.0
		460/3/60	3	15.4	96	19.2	20	12.0
			4	23.7	104	29.6	30	16.0
			5	29.8	113	37.3	40	20.0
			6	29.8	121	37.3	40	24.0

LEGEND

DX — Direct Expansion
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LAT — Leaving-Air Temperature at 70 F Entering-Air Temperature
MCA — Unit Minimum Circuit Ampacity
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PSC — Permanent Split Capacitor

*Left hand coil connections only.

NOTES:
1. LAT (Leaving Air Temperature) (F) is measured at nominal cfm.
2. Water and DX coil used on electric heat units have left-hand coil connections.
3. Electric heat is available in the reheat position only and connections are on the right side.
4. Face and bypass units are available with 3 heating elements only.

Table 3 — Electric Heater Data for Units with ECM

UNIT	HP	NOMINAL V/Ph/Hz	NUMBER OF ELEMENTS	FLA	LAT (F)	MCA	MOCP	TOTAL CAPACITY (kW)
40UV050 (at 500 Cfm)	1/3	208/1/60	3	16.5	90	20.6	25	3.2
			4	21.5	97	26.9	30	4.2
			5	26.6	104	33.2	35	5.3
			6	31.6	110	39.5	40	6.3
		240/1/60	3	18.8	97	23.5	25	4.2
			4	24.6	106	30.8	35	5.6
			5	30.5	115	38.1	40	7.0
			6	36.3	124	45.4	50	8.4
		277/1/60	3	16.3	97	20.3	25	4.2
			4	21.3	106	26.6	30	5.6
			5	26.4	115	33.0	35	7.0
			6	31.4	124	39.3	40	8.4
		208/3/60	3	10.1	90	12.6	15	3.2
			4	15.1	97	18.9	20	4.2
			5	18.8	104	23.5	25	5.3
			6	18.8	110	23.5	25	6.3
		240/3/60	3	11.4	97	14.3	15	4.2
			4	17.2	106	21.6	25	5.6
			5	21.5	115	26.9	30	7.0
			6	21.5	124	26.9	30	8.4
		460/3/60	3	5.4	97	6.8	15	4.2
			4	8.3	106	10.4	15	5.6
			5	10.5	115	13.1	15	7.0
			6	10.5	124	13.1	15	8.4

LEGEND

DX — Direct Expansion
FLA — Full Load Amps
LAT — Leaving-Air Temperature at 70 F Entering-Air Temperature
MCA — Unit Minimum Circuit Ampacity
MOCP — Maximum Overcurrent Protection (Maximum Fuse Size or Circuit Breaker Amps)
PSC — Permanent Split Capacitor

NOTES:
1. LAT (Leaving Air Temperature) (F) is measured at nominal cfm.
2. Water and DX coil used on electric heat units have left-hand coil connections.
3. Electric heat is available in the reheat position only and connections are on the right side.
4. Face and bypass units are available with 3 heating elements only.

Table 3 — Electric Heater Data for Units with ECM (cont)

UNIT	HP	NOMINAL V/Ph/Hz	NUMBER OF ELEMENTS	FLA	LAT (F)	MCA	MOCP	TOTAL CAPACITY (kW)
40UV,UH075 (at 750 Cfm)	1/3	208/1/60	3	24.0	89	30.0	30	4.5
			4	31.2	96	39.0	40	6.0
			5	38.4	102	48.0	50	7.5
			6	45.6	108	57.0	60	9.0
		240/1/60	3	27.3	96	34.1	35	6.0
			4	35.6	104	44.5	45	8.0
			5	44.0	113	55.0	60	10.0
			6	52.3	121	65.4	70	12.0
		277/1/60	3	23.7	96	29.6	30	6.0
			4	30.9	104	38.6	40	8.0
			5	38.1	113	47.6	50	10.0
			6	45.3	121	56.7	60	12.0
		208/3/60	3	14.8	89	18.5	20	4.5
			4	22.0	96	27.6	30	6.0
			5	27.3	102	34.2	35	7.5
			6	27.3	108	34.2	35	9.0
		240/3/60	3	16.8	96	20.9	25	6.0
			4	25.1	104	31.4	35	8.0
			5	31.2	113	39.0	40	10.0
			6	31.2	121	39.0	40	12.0
		460/3/60	3	8.2	96	10.2	15	6.0
			4	12.3	104	15.4	20	8.0
			5	15.4	113	19.2	20	10.0
			6	15.4	121	19.2	20	12.0

LEGEND

DX — Direct Expansion
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NOTES:
1. LAT (Leaving Air Temperature) (F) is measured at nominal cfm.
2. Water and DX coil used on electric heat units have left-hand coil connections.
3. Electric heat is available in the reheat position only and connections are on the right side.
4. Face and bypass units are available with 3 heating elements only.

Table 3 — Electric Heater Data for Units with ECM (cont)

UNIT	HP	NOMINAL V/Ph/Hz	NUMBER OF ELEMENTS	FLA	LAT (F)	MCA	MOCP	TOTAL CAPACITY (kW)
40UV,UH100 (at 1000 Cfm)	1/3	208/1/60	3	31.5	89	39.4	40	6.0
			4	41.1	95	51.4	60	8.0
			5	50.8	102	63.4	70	10.0
			6	60.4	108	75.5	80	11.9
		240/1/60	3	35.9	96	44.9	45	8.0
			4	47.1	104	58.8	60	10.7
			5	58.2	112	72.7	80	13.3
			6	69.3	121	86.6	90	16.0
		277/1/60	3	31.2	96	39.0	40	8.0
			4	40.8	104	51.0	60	10.7
			5	50.4	112	63.1	70	13.3
			6	60.1	121	75.1	80	16.0
		208/3/60	3	19.3	89	24.1	25	6.0
			4	28.9	95	36.2	40	8.0
			5	36.0	102	45.0	50	10.0
			6	36.0	108	45.0	50	11.9
		240/3/60	3	21.9	96	27.3	30	8.0
			4	33.0	104	41.2	45	10.7
			5	41.1	112	51.4	60	13.3
			6	41.1	121	51.4	60	16.0
		460/3/60	3	10.6	96	13.3	15	8.0
			4	16.2	104	20.2	25	10.7
			5	20.3	112	25.3	30	13.3
			6	20.3	121	25.3	30	16.0

LEGEND

DX — Direct Expansion
FLA — Full Load Amps
LAT — Leaving-Air Temperature at 70 F Entering-Air Temperature
MCA — Unit Minimum Circuit Ampacity
MOCP — Maximum Overcurrent Protection (Maximum Fuse Size or Circuit Breaker Amps)
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NOTES:
1. LAT (Leaving Air Temperature) (F) is measured at nominal cfm.
2. Water and DX coil used on electric heat units have left-hand coil connections.
3. Electric heat is available in the reheat position only and connections are on the right side.
4. Face and bypass units are available with 3 heating elements only.

Table 3 — Electric Heater Data for Units with ECM (cont)

UNIT	HP	NOMINAL V/Ph/Hz	NUMBER OF ELEMENTS	FLA	LAT (F)	MCA	MOCP	TOTAL CAPACITY (kW)
40UV,UH125 (at 1250 Cfm)	1/2	208/1/60	3	39.4	89	49.3	50	7.5
			4	51.5	96	64.3	70	10.0
			5	63.5	102	79.4	80	12.5
			6	75.5	108	94.4	100	15.0
		240/1/60	3	45.0	96	56.2	60	10.0
			4	58.9	104	73.6	80	13.3
			5	72.7	113	90.9	100	16.7
			6*	86.6	121	108.3	110	20.0
		277/1/60	3	39.0	96	48.7	50	10.0
			4	51.0	104	63.8	70	13.3
			5	63.1	113	78.8	80	16.7
			6	75.1	121	93.9	100	20.0
		208/3/60	3	24.2	89	30.2	35	7.5
			4	36.2	96	45.3	50	10.0
			5	45.0	102	56.3	60	12.5
			6	45.0	108	56.3	60	15.0
		240/3/60	3	27.4	96	34.2	35	10.0
			4	41.3	104	51.6	60	13.3
			5	51.5	113	64.3	70	16.7
			6	51.5	121	64.3	70	20.0
		460/3/60	3	13.2	96	16.5	20	10.0
			4	20.2	104	25.2	30	13.3
			5	25.3	113	31.6	35	16.7
			6	25.3	121	31.6	35	20.0

LEGEND

DX — Direct Expansion
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NOTES:
1. LAT (Leaving Air Temperature) (F) is measured at nominal cfm.
2. Water and DX coil used on electric heat units have left-hand coil connections.
3. Electric heat is available in the reheat position only and connections are on the right side.
4. Face and bypass units are available with 3 heating elements only.

Table 3 — Electric Heater Data for Units with ECM (cont)

UNIT	HP	NOMINAL V/Ph/Hz	NUMBER OF ELEMENTS	FLA	LAT (F)	MCA	MOCP	TOTAL CAPACITY (kW)
40UV,UH150 (at 1500 Cfm)	1/2	208/1/60	3	46.7	89	58.3	60	9.0
			4	61.1	96	76.4	80	12.0
			5	75.6	102	94.4	100	15.0
			6*	90.0	108	112.5	125	18.0
		240/1/60	3	53.3	96	66.6	70	12.0
			4	70.0	104	87.5	90	16.0
			5*	86.6	113	108.3	110	20.0
			6	—	—	—	—	—
		277/1/60	3	46.2	96	57.8	60	12.0
			4	60.7	104	75.8	80	16.0
			5	75.1	113	93.9	100	20.0
			6	—	—	—	—	—
		208/3/60	3	28.3	89	35.4	40	9.0
			4	42.8	96	53.5	60	12.0
			5	53.4	102	66.7	70	15.0
			6	53.4	108	66.7	70	18.0
		240/3/60	3	32.2	96	40.3	45	12.0
			4	48.9	104	61.1	70	16.0
			5	61.1	113	76.4	80	20.0
			6	61.1	121	76.4	80	24.0
		460/3/60	3	15.6	96	19.5	20	12.0
			4	24.0	104	30.0	30	16.0
			5	30.1	113	37.6	40	20.0
			6	30.1	121	37.6	40	24.0

LEGEND

DX — Direct Expansion
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*Left hand coil connections only.

NOTES:
1. LAT (Leaving Air Temperature) (F) is measured at nominal cfm.
2. Water and DX coil used on electric heat units have left-hand coil connections.
3. Electric heat is available in the reheat position only and connections are on the right side.
4. Face and bypass units are available with 3 heating elements only.

Table 3 — Electric Heater Data for Units with ECM (cont)

UNIT	HP	NOMINAL V/Ph/Hz	NUMBER OF ELEMENTS	FLA	LAT (F)	MCA	MOCP	TOTAL CAPACITY (kW)
40UH200 (at 2000 Cfm)	3/4	208/1/60	3	50.1	84	62.7	70	9.0
			4	64.6	89	80.7	90	12.0
			5	79.0	94	98.8	100	15.0
			6*	93.5	99	116.8	125	18.0
		240/1/60	3	56.8	89	71.0	80	12.0
			4	73.5	96	91.8	100	16.0
			5*	90.1	102	112.7	125	20.0
			6	—	—	—	—	—
		277/1/60	3	48.8	89	61.0	70	12.0
			4	63.3	96	79.1	80	16.0
			5	77.7	102	97.1	100	20.0
			6	—	—	—	—	—
		208/3/60	3	31.8	84	39.8	40	9.0
			4	46.3	89	57.9	60	12.0
			5	56.9	94	71.1	80	15.0
			6	56.9	99	71.1	80	18.0
		240/3/60	3	35.7	89	44.6	45	12.0
			4	52.4	96	65.5	70	16.0
			5	64.6	102	80.8	90	20.0
			6	64.6	108	80.8	90	24.0
		460/3/60	3	16.9	89	21.1	25	12.0
			4	25.2	96	31.5	35	16.0
			5	31.3	102	39.1	40	20.0
			6	31.3	108	39.1	40	24.0

LEGEND

DX — Direct Expansion
FLA — Full Load Amps
LAT — Leaving-Air Temperature at 70 F Entering-Air Temperature
MCA — Unit Minimum Circuit Ampacity
MOCP — Maximum Overcurrent Protection (Maximum Fuse Size or Circuit Breaker Amps)
PSC — Permanent Split Capacitor

*Left hand coil connections only.

NOTES:
1. LAT (Leaving Air Temperature) (F) is measured at nominal cfm.
2. Water and DX coil used on electric heat units have left-hand coil connections.
3. Electric heat is available in the reheat position only and connections are on the right side.
4. Face and bypass units are available with 3 heating elements only.

Table 4 — Motor Data

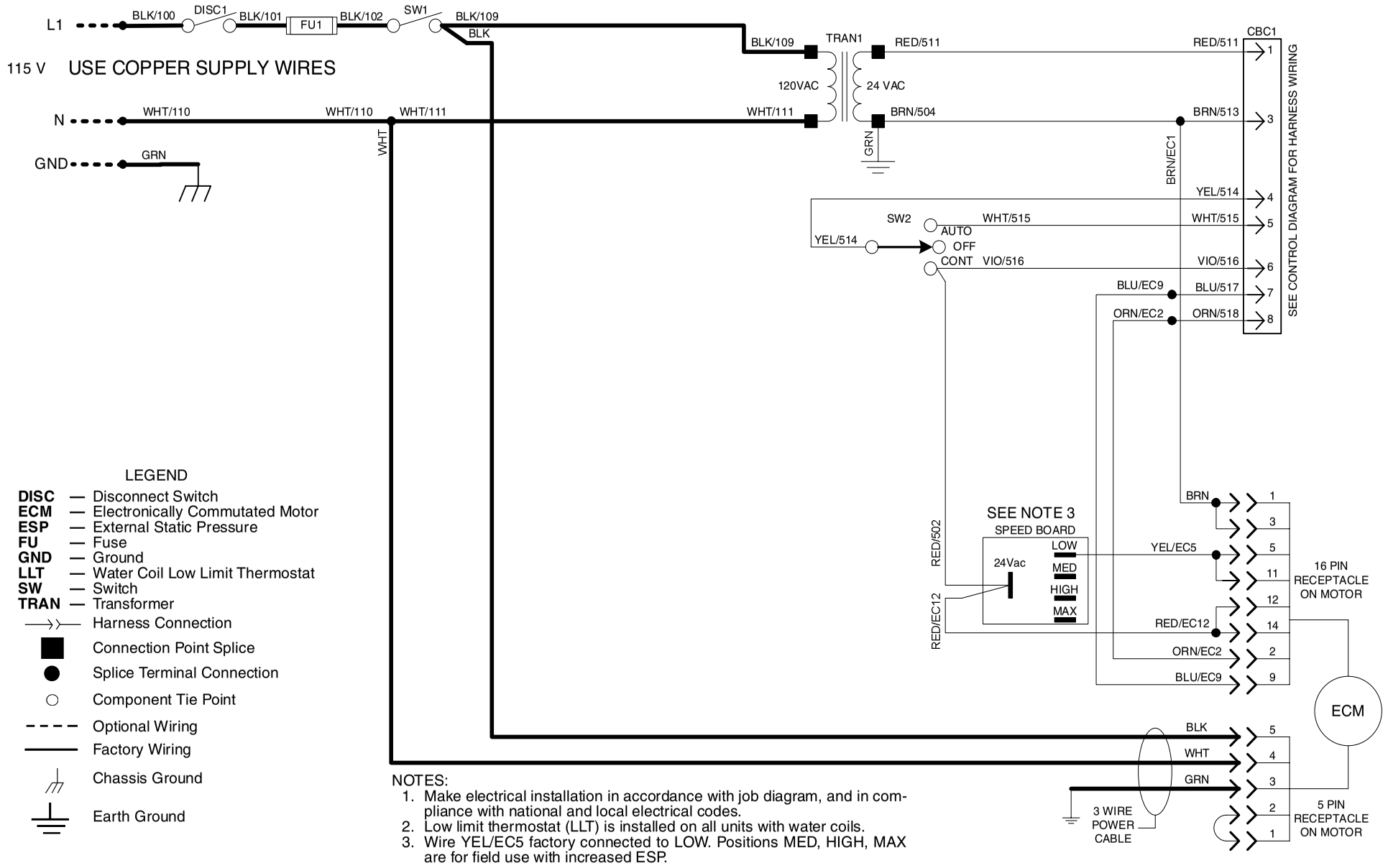
PSC MOTORS						
UNIT 40UV,UH SIZE	**MOTOR Hp**	**VOLTAGE**	**FLA**	**MCA**	**MOP (Amps)**	**MAX FUSE SIZE (Amps)**
050*	1/5	115	3.7	4.6	8.3	15
		208/230	2.0	2.5	4.5	15
		265	1.6	2.0	3.6	15
075	1/5	115	3.7	4.6	8.3	15
		208/230	2.0	2.5	4.5	15
		265	1.6	2.0	3.6	15
100	1/5	115	3.7	4.6	8.3	15
		208/230	2.0	2.5	4.5	15
		265	1.6	2.0	3.6	15
125	1/5	115	3.7	4.6	8.3	15
		208/230	2.0	2.5	4.5	15
		265	1.6	2.0	3.6	15
150	1/5	115	3.7	4.6	8.3	15
		208/230	2.0	2.5	4.5	15
		265	1.6	2.0	3.6	15

ECM						
UNIT 40UV,UH SIZE	**MOTOR Hp**	**VOLTAGE**	**FLA**	**MCA**	**MOP (Amps)**	**MAX FUSE SIZE (Amps)**
050*	1/3	115	1.4	1.8	3.1	15
		208/230	1.3	1.6	2.9	15
		265	1.1	1.4	2.6	15
075	1/3	115	3.7	4.6	8.3	15
		208/230	2.3	2.9	5.1	15
		265	2.0	2.5	4.5	15
100	1/3	115	4.0	5.0	9.1	15
		208/230	2.6	3.2	5.8	15
		265	2.3	2.9	5.1	15
125	1/2	115	4.7	5.9	10.6	15
		208/230	3.3	4.1	7.4	15
		265	2.9	3.6	6.6	15
150	1/2	115	4.7	5.9	10.6	15
		208/230	3.3	4.1	7.4	15
		265	2.9	3.6	6.6	15
200†	3/4	115	9.6	12.0	21.6	20
		208/230	6.8	8.5	15.3	15
		265	5.5	6.9	12.4	15

LEGEND

ECM — Electronically Commutated Motor
FLA — Full Load Amps
MCA — Minimum Circuit Amps
MOP — Maximum Overload Protection
PSC — Permanent Split Capacitor

*Available in vertical configuration only.
†Available in horizontal configuration only.



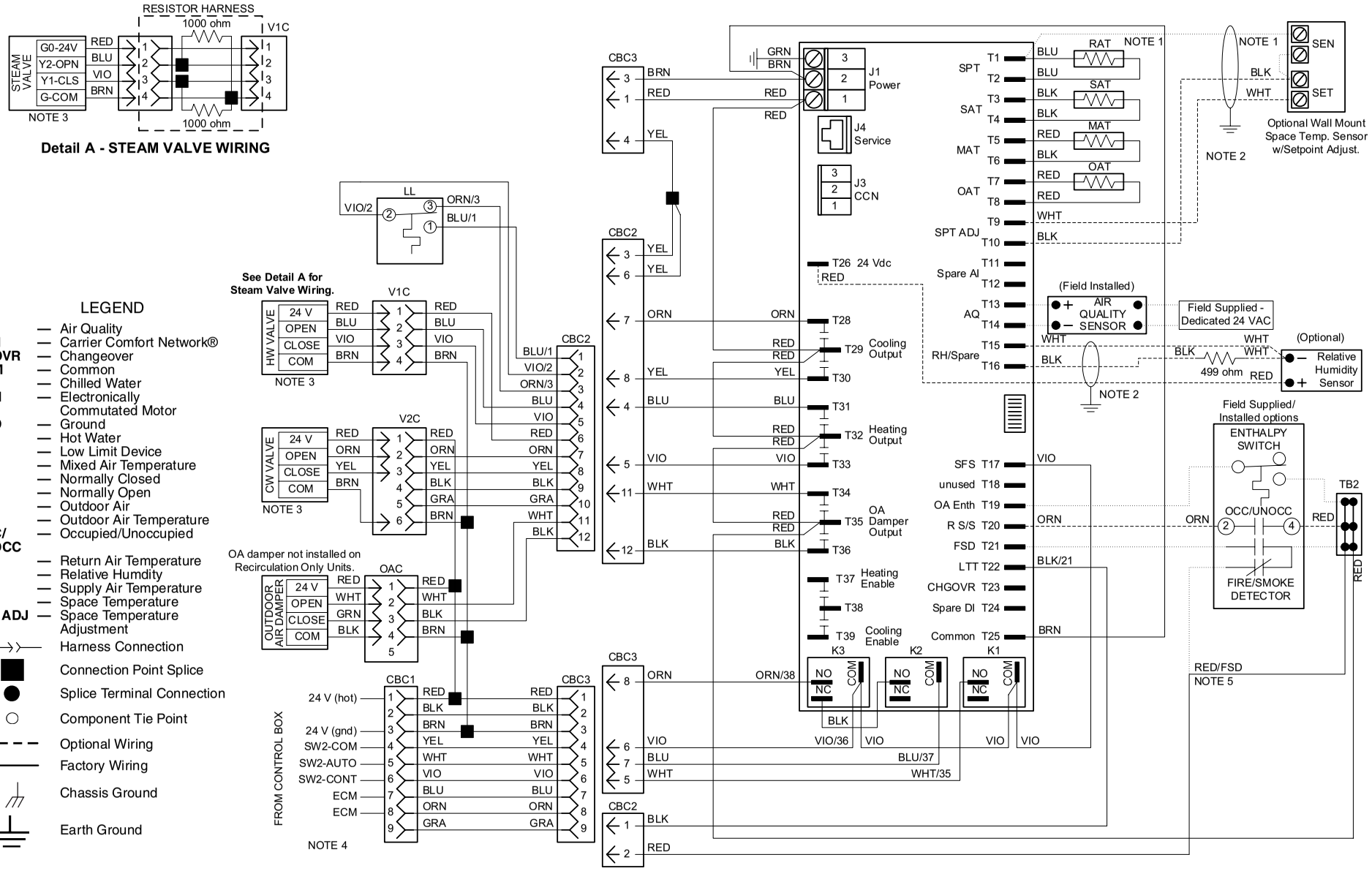
LEGEND

DISC	— Disconnect Switch
ECM	— Electronically Commutated Motor
ESP	— External Static Pressure
FU	— Fuse
GND	— Ground
LLT	— Water Coil Low Limit Thermostat
SW	— Switch
TRAN	— Transformer

Harness Connection
Connection Point Splice
Splice Terminal Connection
Component Tie Point
Optional Wiring
Factory Wiring
Chassis Ground
Earth Ground

NOTES:
1. Make electrical installation in accordance with job diagram, and in compliance with national and local electrical codes.
2. Low limit thermostat (LLT) is installed on all units with water coils.
3. Wire YEL/EC5 factory connected to LOW. Positions MED, HIGH, MAX are for field use with increased ESP.

Fig. 8A — Unit Ventilator Wiring with CCN Controls — Control Box (115 vac)



NOTES:
1. When factory installed, optional wall-mount space sensor is wired to provide set point adjustment only. When remote sensor installation is field required, disconnect the factory-supplied return air sensor and wire as shown.
2. Use shielded wire when field installing these parts. Connect the drain wire to the unit chassis and insulate the sensor end. Factory wiring consists of unshielded wire.
3. Hot water (HW) valve opens on loss of power. Chilled Water (CW) valve closes on loss of power.
4. See power diagram for CBC1 wiring.
5. Wire RED/FSD factory wired to TB2. When field installing a fire/smoke detector, remove RED/FSD from TB2 and wire as shown.

Fig. 8B — Unit Ventilator Wiring with CCN Controls — Control Diagram (115 vac)

Make Duct Connections — If applicable, install all ductwork to and from unit in accordance with all applicable codes. Duct construction must allow unit to operate within duct external static pressure limits as shown on job submittals and in Tables 5 and 6. Duct opening should be the same size as the unit. For units ducted to multiple openings, make sure there is adequate straight duct, as shown below, immediately after the unit.

40UH	075	100	125	150	200
Minimum Straight Duct Required (Length in ft)	45	52	58	63	75

⚠ CAUTION

Units designed to operate with ductwork may be damaged if operated without intended ductwork attached.

Ensure that units ducted to multiple openings have sufficient straight duct immediately after the unit.

Units provided with outside air must utilize the low-temperature safety switch to prevent coil freeze-up.

Insulate all ductwork as required. Use flexible connections to minimize duct-to-unit alignment problems and noise transmission where specified.

Install ductwork, grilles, and plenums so that they do not restrict access to filter.

Cut openings for supply and return air grilles, thermostats, and switch plates where specified on job drawings. Be careful not to cut wires, piping, or structural supports. Use a steel thermostat shield ring to protect drywall from thermostat wiring where applicable.

Prevent dust and debris from settling in unit. If wall finish or color is to be applied by spraying, cover all openings to prevent spray from entering unit.

Table 5 — Unit Ventilator Airflow — PSC Motor*

FACTORY SETTINGS — CHILLED WATER COIL APPLICATIONS

Unit	Speed	Approximate Air Delivery (Cfm)						
		1-Row	2-Row	3-Row	4-Row	5-Row	6-Row	7-Row
40UV050	Max	522	510	497	485	490	489	457
	High	503	490	476	464	473	476	444
	Low	458	449	440	425	452	455	430
40UV,UH075	Max	806	778	750	747	766	732	697
	High	682	664	645	629	621	596	570
	Low	569	554	539	527	533	514	495
40UV,UH100	Max	1064	1033	1001	1013	973	980	967
	High	662	659	655	642	763	740	717
	Low	530	519	507	503	498	501	504
40UV,UH125	Max	1295	1285	1215	1218	1239	1250	1175
	High	899	930	876	865	852	846	846
	Low	568	616	597	570	568	558	573
40UV,UH150	Max	1542	1480	1500	1484	1468	1482	1374
	High	1071	1068	1065	1034	1033	1031	1013
	Low	812	801	790	881	848	842	799

FACTORY SETTINGS — ELECTRIC HEAT/DX COIL APPLICATIONS

Unit	Speed	Approximate Air Delivery (Cfm)						
		1-Row	2-Row	3-Row	4-Row	5-Row	6-Row	7-Row
40UV050	Max	522	510	497	485	490	489	457
	High	503	490	476	464	452	455	430
	Low	458	449	440	425	410	414	406
40UV,UH075	Max	806	778	750	747	766	732	697
	High	682	664	645	629	621	596	570
	Low	569	554	539	527	533	514	495
40UV,UH100	Max	1064	1033	1001	1013	973	980	967
	High	794	788	782	773	857	834	810
	Low	662	659	655	642	628	620	611
40UV,UH125	Max	1295	1285	1215	1218	1239	1250	1175
	High	1055	1040	1024	995	1099	1091	1052
	Low	738	767	732	719	987	986	964
40UV,UH150	Max	1542	1480	1500	1484	1468	1482	1374
	High	1285	1257	1229	1248	1246	1239	1199
	Low	934	928	922	901	1033	1031	1013

LEGEND

CX — Chilled Water Applications
DX — Direct Expansion
HW — Hot Water

*Standard on sizes 050-150.

NOTE: Use the table below to determine the heating and cooling coil combinations available with PSC Motor operation.

COOLING COIL	HEATING COIL		
	HW	Steam	Electric
5 Rows CW	1 or 2 rows	N/A	3 elements
4 Rows CW	3 rows	1 or 2 rows	4 elements
3 Rows CW or DX†	4 rows	1 or 2 rows	5 or 6 elements

†DX cooling applications are only available in 3-row cooling configurations.

Table 6 — Unit Ventilator Airflow — ECM Airflow

UNIT SIZE	MOTOR HP	COIL TYPE	APPROXIMATE AIR DELIVERY (Cfm)											
			ESP Speed Board Position											
			Low Position (0.0 in. wg)			Med Position (0.10 in. wg)			High Position (0.25 in. wg)			Max Position (0.45 in. wg)		
			Max	High	Low	Max	High	Low	Max	High	Low	Max	High	Low
40UV050	1/3	CW	499	336	248	—	—	—	—	—	—	—	—	—
		3-4EH/DX	499	419	336	—	—	—	—	—	—	—	—	—
		5-6EH	491	380	324	—	—	—	—	—	—	—	—	—
40UV,UH075	1/3	CW	747	484	346	753	548	432	752	530	437	751	541	386
		3-4EH/DX	747	644	498	753	609	472	752	612	470	751	618	498
		5-6EH	755	645	583	746	598	539	755	585	554	765	610	542
40UV,UH100	1/3	CW	997	703	505	987	693	543	1012	663	483	994	692	480
		3-4EH/DX	997	853	615	987	850	639	1012	823	626	994	819	618
		5-6EH	1016	819	719	1002	851	709	1024	798	787	1024	820	734
40UV,UH125	1/2	CW	1266	880	657	1239	905	609	1235	898	676	1231	898	627
		3-4EH/DX	1266	1023	769	1239	1055	758	1235	1037	765	1231	1010	778
		5-6EH	1259	1049	897	1239	995	888	1226	995	888	1253	994	919
40UV,UH150	1/2	CW	1503	1033	775	1479	1046	712	1494	1020	770	1486	1075	737
		3-4EH/DX	1503	1246	956	1479	1216	965	1494	1209	927	1486	1222	917
		5-6EH	1517	1222	1068	1490	1206	1087	1498	1159	1120	1503	1188	1074
40UH200	3/4	ALL	2014	1384	1023	1981	1386	971	1965	1385	997	1814	1354	993

LEGEND

3-4EH/DX — Direct Expansion Coil Applications with 3 to 4 Elements of Electric Heat
5-6EH — 5 to 6 Elements of Electric Heat
CW — Chilled Water Applications
ESP — External Static Pressure

NOTES:
1. Factory default is Low Position.
2. Med, High, and Max positions are field settings.

Make Final Preparations

1. Turn power off (lock out and tag electrical disconnect).
2. Install thermostats and perform any other final wiring as applicable.
3. Clean dirt, dust, and other construction debris from unit interior. Be sure to check fan wheel and housing.
4. Rotate fan wheel by hand to be sure it is free and does not rub on housing.
5. Be sure drain line is clear and is properly and securely positioned. Pour water into drain to check operation.
6. Vent all air from unit coil and related piping. If air vent is manual, release air from system by turning air vent screw 1 1/2 turns counterclockwise with screwdriver. When steady stream of water begins to escape, close valve. If air vent is automatic, trapped air will be vented automatically. Vent releases air slowly, usually dripping water into drain pan in the process.

   Make sure all service valves are open and that motorized control valves, if supplied, are set for automatic operation.
7. Check all control valves in the system for proper operation in accordance with valve manufacturer's instructions.
8. For units with factory-installed balancing valves, adjust as follows:
   a. Butterfly valves — Turn valve gate by inserting screwdriver into slot in valve top and rotating up to 90 degrees. Valve is fully open when slot is parallel with valve body. When slot is perpendicular to body, flow through valve is at minimum. Valve does not seal against flow.
   b. Ball valves with lever handles — Valve gate action is similar to butterfly valves above except that when handle is perpendicular to valve body, there is no flow through valve. Ball valves may be used as shutoff valves.
9. Install filter in frame at front of coil. If field-supplied filters are used, be sure size is correct. See Table 1 for filter data.
10. Ensure all panels and filters are installed before checking fan operation. Turn on unit power. Check fan and motor operation.

IMPORTANT: Do not start up or operate unit without filter and panels installed. Be sure filter and unit interior are clean.

PRODUCT INTEGRATED CONTROL

Physical Characteristics — Figure 9 shows the location of factory-supplied and factory-installed sensors, switches, and devices (standard and optional). Tables 7-11 summarize the Unit Ventilator Comfort Control module offerings and accessory packages.

The control includes the electronic control board assembly, fuses, relay, transformer, terminal block, low-limit air temperature protection (water coil units only), and other devices. A disconnect switch, located below the control box, is provided to shut off the power to the control box (see Fig. 10). See Tables 8 and 9 for factory-installed options and accessory packages.

Control environmental limitations are as follows:

Shipping Temperature	-40 to 185 F
Shipping Humidity	10 to 95%
Operating Temperature	32 to 140 F
Operating Humidity	10 to 90%

The Unit Ventilator Comfort Control module is powered from the same source as the unit's single source power connection.

Field wiring for accessories terminates in the control enclosure. Control accessory wiring requirements are 18 or 20 gage, 2 or 3 conductor twisted as specified. Refer to wiring details for more information. See Table 10 for control board terminal designations.

Carrier's 40UV,UH unit ventilators with factory-installed controls are ETL listed and listed to UL standard 1995 for heating and cooling equipment. All listings are for the complete unit and all factory-supplied accessories. Use of other accessory components are not covered under these listings.

Table 7 — Standard Control Offerings

All control offerings provide the following features:

1. A 3-speed automatic fan control that minimizes fan noise by matching the fan speed to the load. This process provides better dehumidification during cooling and reduces energy consumption.
2. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Cycle I, Cycle II, or Cycle III damper control options (Cycle II default).
3. Configurable minimum ventilation set point (cfm) for ASHRAE Cycle II or Cycle III damper control.
4. Demand controlled ventilation with optional sensor to meet ventilation requirements with improved efficiency.
5. Coil freeze protection on all units except non-water units.
6. Proportional Integrated Derivative (PID) logic heating, cooling and damper controls to maintain temperature.
7. Adjustable filter maintenance timer on all units.
8. Direct shaft coupled, electric actuators on all dampers. Spring return on outdoor-air (OA) damper.
9. Spring return modulating water valves.
10. Optional relative humidity sensor for high humidity control or dehumidification.
11. Optional remote-mounted space sensor with set point adjustment, tenant override, and service port jack.
12. Optional linkage thermostat with time clock, set point adjustment, schedule and holiday programming, digital temperature, set point and equipment status display.

CONTROL SEQUENCE	APPLICATION
	Heating/Cooling Valve Control
2A/3A	Chilled Water/Hot Water, 2-Pipe Changeover
2B/3B	Chilled Water/Hot Water or Steam, 4-Pipe
2D/3D	Chilled Water with Electric Heat
2F/3F	Hot Water or Steam Heating Only
2G/3G	Hot Water or Steam with DX Cooling
2J/3J	Chilled Water Cooling Only
	Heating/Cooling with Face and Bypass Damper Control
20/30	Chilled Water/Hot Water, 2-Pipe Changeover
21/31	Chilled Water/Hot Water or Steam, 4-Pipe
22/32	Chilled Water with Electric Heat
23/33	Hot Water or Steam with DX Cooling
24/34	Hot Water or Steam Heating Only
25/35	Chilled Water Cooling Only
	Heating/Cooling with Humidity Control
2M/3M	F&B Chilled Water/Hot Water or Steam Heating 4-Pipe plus Valve Control Reheat for Dehumidification
2G/3G	Cooling with Hot Water or Steam Reheat, Valve Control
2B/3B	Chilled Water/Hot Water Reheat, 4-Pipe Valve Control
2K/3K	F&B Chilled Water Cooling with Hot Water or Steam Valve Control Reheat, 4-Pipe
	Non-Water Systems
OC	Electric Heat Only
OE	Electric Heat with DX Cooling
OH	DX Cooling Only

LEGEND

DX — Direct Expansion
F&B — Face and Bypass

Table 8 — Field-Installed Accessories

PACKAGE NO.	PACKAGE DESCRIPTION
33CSKITLST-01	Programmable Linkage Thermostat with Timeclock
CGCDXSEN001A00	Wall-Mounted CO_2 Sensor (No Display)
CGCDXSEN002A00	Wall-Mounted CO_2 Sensor with Display
CGCDXGAS001A00	CO_2 Sensor Calibration Service Kit
HL39ZZ003	Wall-Mounted Relative Humidity Sensor

Table 9 — Factory-Installed Options

CODE	DESCRIPTION
DIGIT #15 (2,S,M,4,V)	Space Temperature Sensor
DIGIT #15 (1,0,R,3)	Changeover Switch

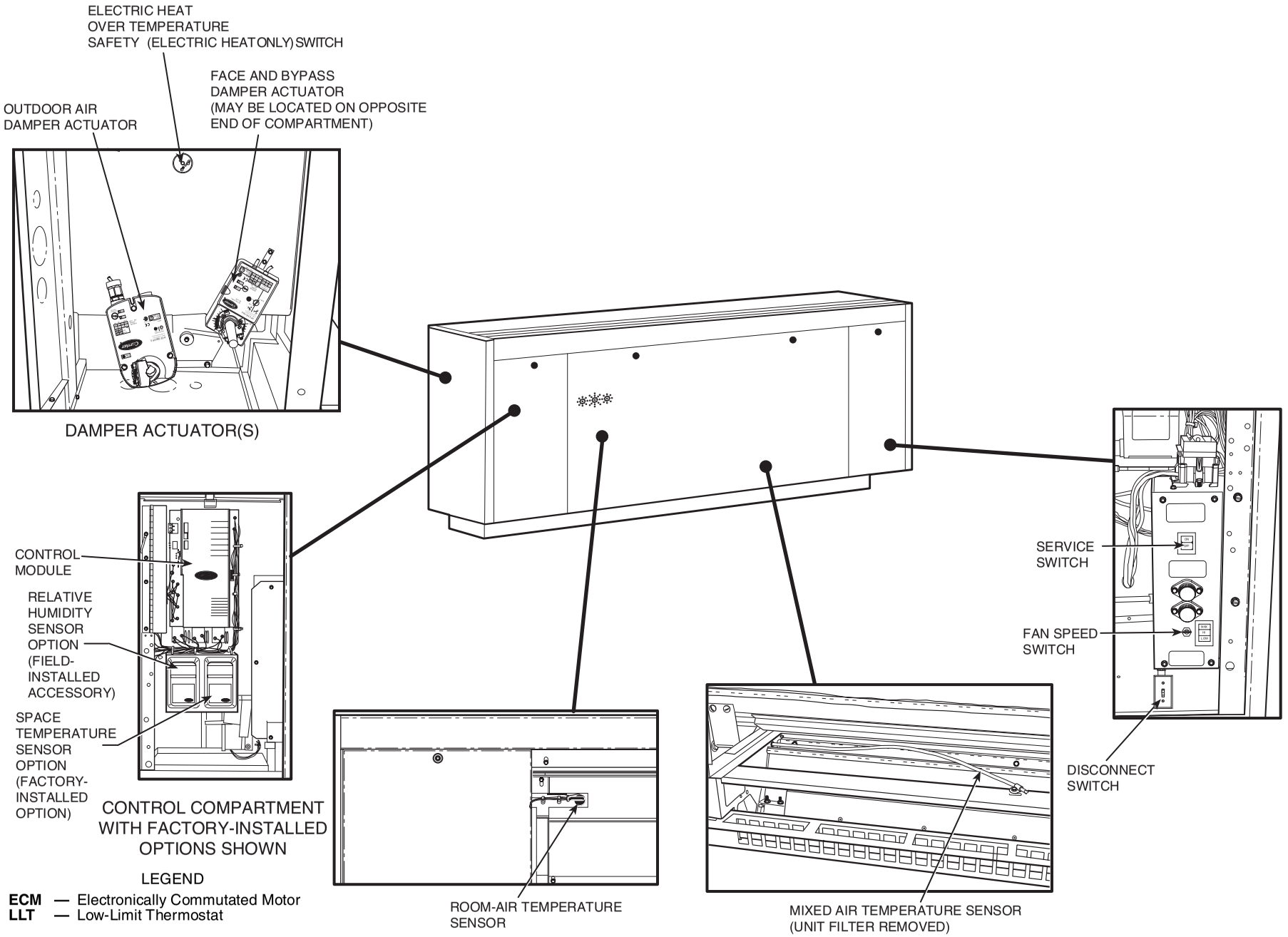


Fig. 9 — Typical Unit Ventilator Comfort Control Module Sensor, Switch, and Device Locations

Table 10 — Control Board Terminal Designations

CONTROL BOARD TERMINAL	FUNCTION
T1	Space Temperature (+)
T2	Space Temperature (Gnd)
T3	Supply-Air Temperature (+)
T4	Supply-Air Temperature (Gnd)
T5	Mixed-Air Temperature (+)
T6	Mixed-Air Temperature (Gnd)
T7	Outdoor-Air Temperature (+)
T8	Outdoor-Air Temperature (Gnd)
T9	Space Temperature Adjust (+)
T10	Space Temperature Adjust (Gnd)
T11	Not Used
T12	Not Used
T13	Air Quality (+)
T14	Air Quality (Gnd)
T15	Relative Humidity (+)
T16	Relative Humidity (Gnd)
T17	Fan Status
T18	Not Used
T19	Outdoor Air Enthalpy
T20	Remote Start/Stop
T21	Fire/Smoke Status
T22	Freezestat
T23	Changeover
T24	Spare
T25	Common/Ground
T26	24 VDC (External Power Supply)
T27	Not Available
T28	Cooling First Stage or Valve Open
T29	Cooling Common
T30	Cooling Second Stage or Valve Close
T31	Heating First Stage or Valve Open
T32	Heating Common
T33	Heating Second Stage or Valve Close
T34	OAD Open
T35	OAD Common
T36	OAD Close
T37	Heating Enable
T38	Common
T39	Cooling Enable

LEGEND

Gnd — Ground
OAD — Outdoor-Air Damper

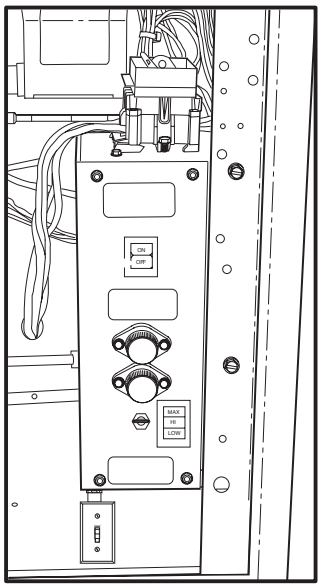
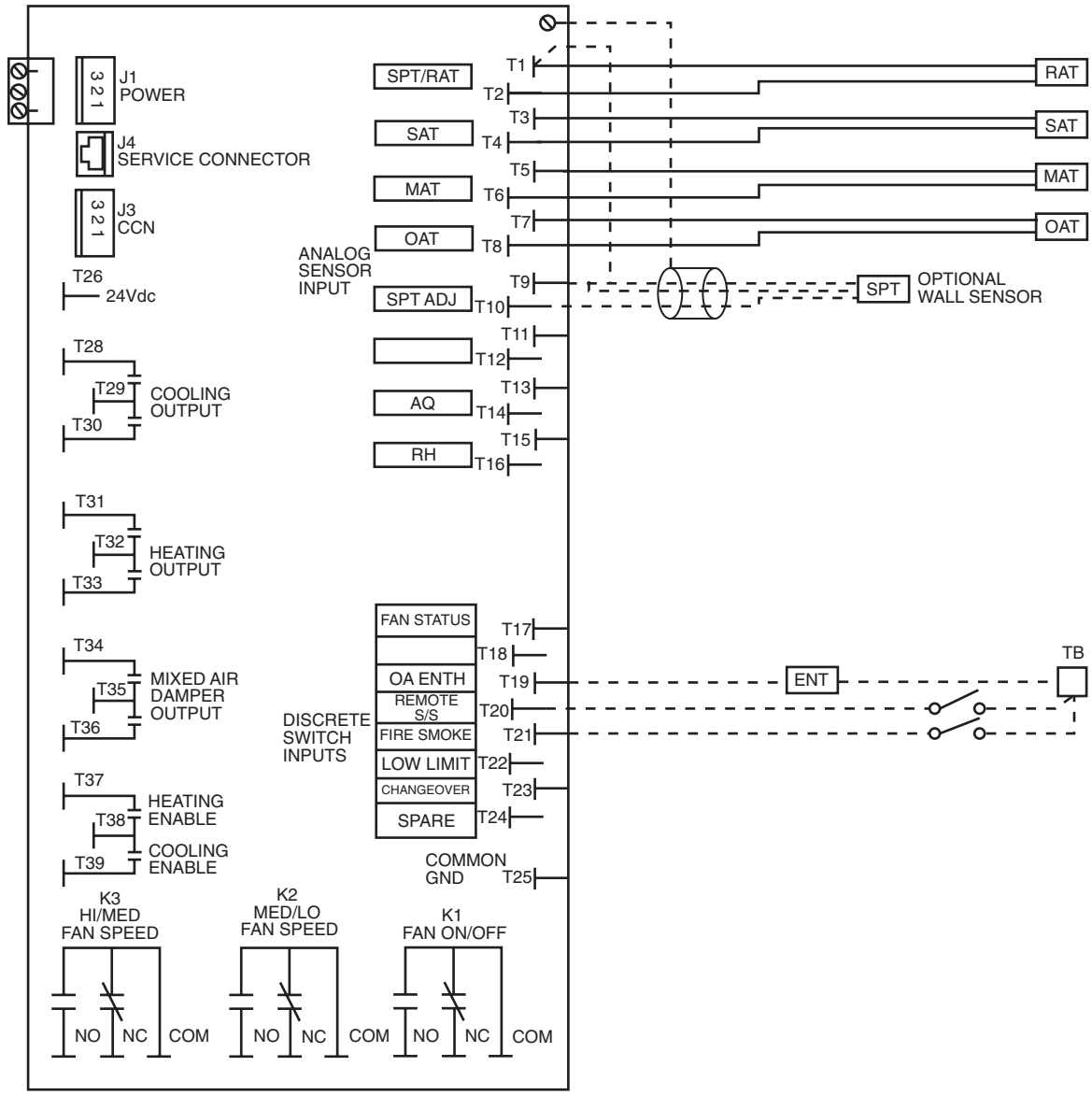


Fig. 10 — Control Switch Location

Unit Ventilator Comfort Control Module Installation and Field Wiring — The module is factory-installed and factory-wired within the control compartment. The Unit Ventilator Comfort Control module contains the software and microprocessor that operates the unit. It continuously monitors inputs and controls outputs such as the fan cooling and heating coil valves and dampers. Refer to Fig. 11 for wiring diagram connections between the unit's sensors and actuators and the control module. Direct expansion cooling and/or electric heat stage control are also provided.



LEGEND

ADJ	— Adjust	**NC**	— Normally Closed
AQ	— Air Quality	**NO**	— Normally Open
CCN	— Carrier Comfort Network® Controls	**RAT**	— Return-Air Temperature Sensor
COM	— Common	**S/S**	— Start/Stop
ENT	— Enthalpy Sensor	**SAT**	— Supply-Air Temperature Sensor
GND	— Ground	**SPT**	— Space Temperature Sensor
MAT	— Mixed-Air Temperature Sensor	**RH**	— Relative Humidity
OA ENTH	— Outdoor-Air Enthalpy	**TB**	— Terminal Block
OAT	— Outdoor-Air Temperature Sensor		

NOTE: Only one SPT sensor can be used. If wall-mounted sensor option is used, unit-mounted sensor wire to terminal T1 must be removed.

Fig. 11 — Unit Ventilator Comfort Control Module with Sensor Connections

Sensors

ROOM-AIR TEMPERATURE (RAT) SENSOR — The RAT sensor is factory-installed and factory-wired to the control. It measures the temperature of the air returning to the unit from the space.

The sensor consists of a thermistor, encased within an epoxy bead. See Fig. 12. It is mounted behind the front center panel, where it is hidden from view.

The sensor has a range of –40 to 245 F with a nominal resistance of 10,000 ohms at 77 F. The sensor is connected to terminals T1 and T2 on the controller board. See Table 11. Polarity is not a consideration. See Table 10 for resistance vs temperature values.

SUPPLY-AIR TEMPERATURE (SAT) SENSOR — The SAT is factory-installed and factory-wired to the control module. It measures the temperature of the air leaving the unit.

The sensor consists of a thermistor encased within an epoxy bead. It is mounted in the fan discharge with the probe mounted to sense the air temperature supplied to the room. See Fig. 12.

The sensor's thermistor has a range of –40 to 245 F with a nominal resistance of 10,000 ohms at 77 F.

NOTE: A temperature of the supply air includes fan heat.

In the control box, the sensor wires are connected to terminals T3 and T4 (SAT) on the controller board (see Table 11). Polarity is not a consideration. See Table 12 for resistance vs temperature values.

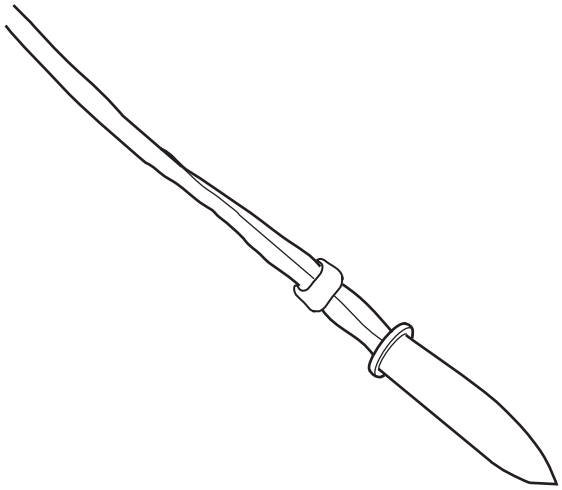


Fig. 12 — Room-Air Temperature and Supply-Air Temperature Sensor (Part No. HN79NZ005)

Table 11 — Sensor Connections

SENSOR	CONTROL MODULE PIN NO.
Unit Mounted Room-Air Temperature Sensor (RAT)	T1 and T2
Space Temperature Sensor (SPT) Wall Mount (Option)	T1, T9, T10, Shield
Supply-Air Temperature (SAT)	T3 and T4
Mixed-Air Temperature Sensor (MAT)	T5 and T6
Outdoor-Air Temperature Sensor (OAT)	T7 and T8

Table 12 — Thermistor Resistance vs Temperature Values for Room-Air Temperature Sensor, Supply-Air Temperature Sensor, Mixed-Air Temperature Sensor, and Optional Space Temperature Sensor

TEMP (C)	TEMP (F)	RESISTANCE (Ohms)
–40	–40	335,651
–35	–31	242,195
–30	–22	176,683
–25	–13	130,243
–20	–4	96,974
–15	5	72,895
–10	14	55,298
–5	23	42,315
0	32	32,651
5	41	25,395
10	50	19,903
15	59	15,714
20	68	12,494
25	77	10,000
30	86	8,056
35	95	6,530
40	104	5,325
45	113	4,367
50	122	3,601
55	131	2,985
60	140	2,487
65	149	2,082
70	158	1,752

OUTDOOR-AIR TEMPERATURE (OAT) SENSOR — The OAT sensor is factory-installed and factory-wired to the control. The OAT sensor monitors the temperature of the outside air entering the unit. See Fig. 13.

The sensor is installed immediately upstream from the outdoor-air damper where it will accurately sense the temperature of the outdoor air entering the mixing box. The sensor connects to the control module T7 and T8 (OAT) as shown in Table 11.

The thermistor has a range of –40 to 245 F and a resistance of 5,000 ohms at 77 F. See Table 13 for thermistor resistance according to temperature value.

MIXED-AIR TEMPERATURE (MAT) SENSOR — The mixed-air temperature (MAT) sensor is factory-supplied, factory-installed, and factory-wired with each unit. The MAT measures the temperature of air in the mixing plenum area.

The MAT connects to terminals T5 and T6 on the control module using $^1/_4$-in. female quick connect terminals. See Table 11.

The sensor uses multiple thermistor elements. This sensor provides both mechanical and electrical averaging to achieve an accurate, average temperature measurement over the entire element length. Polarity is not a consideration. See Table 12 for resistance vs temperature values. The sensor is installed in the mixing plenum before the filter so it can sense the average air temperature. See Fig. 14.

The MAT has range of –40 to 245 F with a nominal resistance of 10,000 ohms at 77 F.

LOW-LIMIT THERMOSTAT — The low-limit thermostat (LLT) is factory-installed and factory-wired on all units with water coils. The thermostat is used to protect the water coils from freezing temperatures in the event of a malfunction by detecting the status of a potentially damaging condition.

The LLT is a 12-ft capillary tube mounted in the air stream. See Fig. 15.

The LLT provides a SPDT contact. The contact provides a sensor status indication to the control module and an electrical interlock to the fan and water valves. Upon detection of a fault condition, the unit ventilator will stop the fan, close the outdoor-air damper, and position water valves as specified in the sequence of operation. The LLT is factory set to trip at 38 F. The temperature setting is non-adjustable. The switch will automatically reset and restart the fan after its temperature has risen by at least 5° F.

Table 13 — Thermistor Resistance vs Temperature Values for Outdoor-Air Temperature Sensor

RESISTANCE (Ohms)	TEMPERATURE (F)
168,250.0	–40
121,350.0	–31
88,500.0	–22
65,200.0	–13
48,535.0	–4
36,476.0	5
27,665.0	14
21,165.0	23
16,325.0	32
12,695.0	41
9,950.0	50
6,245.0	68
5,000.0	77
4,028.5	86
3,265.0	95
2,663.3	104
2,185.0	113
1,801.5	122
1,493.0	131
1,244.0	140
1,041.5	149
876.0	158
739.5	167
627.5	176

The LLT is designed to trip if any 1-ft section of the capillary tube senses cold air at or below the thermostat setting. The temperature must exceed 43 F for the thermostat to automatically reset to restore the circuit to normal operation.

REFRIGERANT LOW-LIMIT THERMOSTAT — The refrigerant low limit thermostat (LLR) is factory-installed and factory-wired on all units with direct expansion coils. The thermostat is used to protect the water coils from freezing temperatures in the event of a malfunction by detecting the status of a potentially damaging condition.

The LLR is a 18 in. capillary tube mounted in the air stream. See Fig. 15.

The LLR provides a SPDT contact. The normally closed contact is connected in series with the direct expansion relay coil, such that the DX (direct expansion) control relay is deenergized in a fault condition. The LLR is factory set to trip at 28 F. The temperature setting is non-adjustable. The switch will automatically reset and allow direct expansion relay operation when the temperature has risen by at least 5° F.

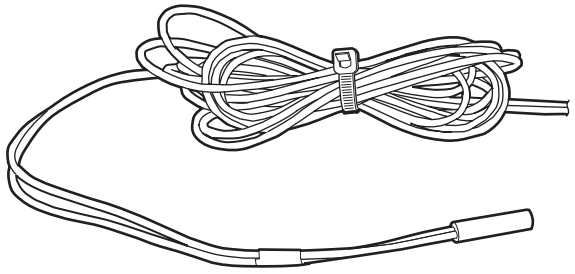


Fig. 13 — Outdoor-Air Temperature Sensor (Part No. HH79NZ055)

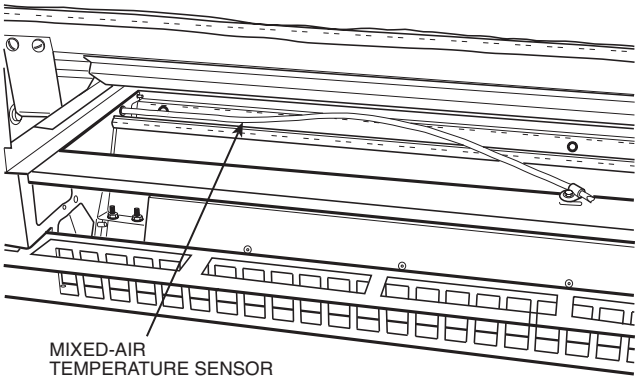


Fig. 14 — Mixed-Air Temperature Sensor Installed in Mixing Plenum (Part No. HH79NZ075)

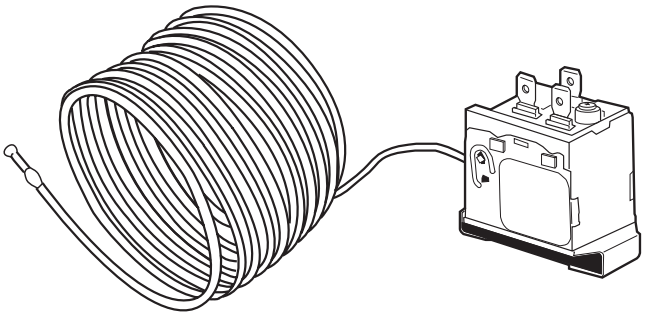


Fig. 15 — Low-Limit Thermostat

The LLR is designed to trip if any 1-ft section of the capitally tube senses cold air below the LLR set point. The temperature must exceed 33 F for the LLR to automatically reset to restore normal operations.

SPACE TEMPERATURE SENSOR (Factory-Installed Option) — The space temperature sensor is used to measure the building interior temperature. See Fig. 16.

The sensor is shipped with the unit, factory-wired and factory-mounted in the control swing panel inside the left hand compartment.

If remote temperature sensing is required, then the sensor may be removed and mounted on an internal wall where temperature sensed is representative of the entire zone to be serviced by the unit. The sensor wall plate accommodates the National Electrical Manufacturers Association (NEMA) standard 2 x 4 junction box. The sensor can be mounted directly on the wall surface if acceptable by local codes.

Do not mount the sensor in drafty locations (such as near air-conditioning or heating ducts), over heat sources (such as baseboard heaters or radiators), or directly above wall-mounted lighting dimmers. Do not mount the sensor near a window which may be opened, near a wall corner, or near a door. Sensors mounted in these areas will have inaccurate and erratic sensor readings.

The sensor should be mounted approximately 5 ft from the floor, in an area representing the average temperature in the space. Allow at least 4 ft between the sensor and any corner and mount the sensor at least 2 ft from an open doorway.

Install the sensor as follows (see Fig. 17):

1. Locate the two Allen head screws at the bottom of the sensor.
2. Turn the two screws clockwise to release the cover from the sensor wall mounting plate.
3. Lift the cover from the bottom and then release it from the top fasteners.
4. Feed the wires from the electrical box through the opening in the center of the sensor mounting plate.
5. Using two no. 6-32 x 1 mounting screws (provided with the sensor), secure the sensor to the electrical box.
6. Use a three-conductor 20 gage shielded cable. The wire is suitable for distances of up to 500 ft. The standard CCN (Carrier Comfort Network®) communication cable may be used. If the set point adjustment (slide-bar) is not required, then an unshielded, 18 or 20 gage, two-conductor, twisted pair cable may be used.

   The CCN network service jack requires a separate, shielded three-conductor CCN communication cable. Always use separate cables for CCN communication and sensor wiring. (Refer to Fig. 18 for wire designations.)
7. Replace the cover by inserting the cover at the top of the mounting plate first, then swing the cover down over the lower portion. Rotate the two Allen head screws counterclockwise until the cover is secured to the mounting plate and locked in position.

For more sensor information see Table 12 for thermistor resistance vs temperature values.

NOTE: Clean sensor with damp cloth only. Do not use solvents.

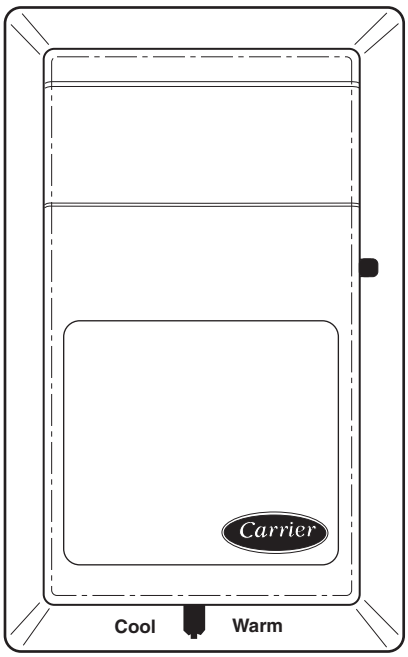
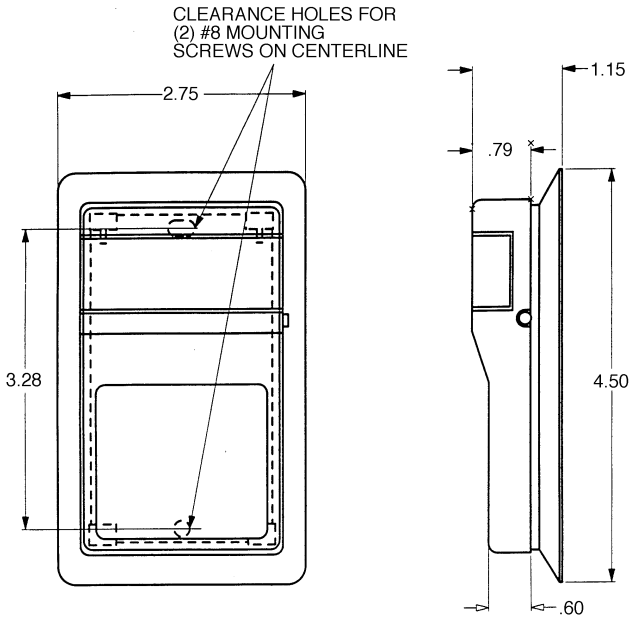


Fig. 16 — Space Temperature Sensor (P/N HH51BX005)



NOTE: Dimensions are in inches.

Fig. 17 — Space Temperature Sensor and Wall-Mounted Humidity Sensor Mounting

WIRING THE SPACE TEMPERATURE SENSOR AND SET POINT ADJUSTMENT — To wire the sensor and slidebar, perform the following (see Fig. 18):

1. Identify which cable is intended for sensor wiring.
2. Strip back the jacket from the cables at least 3 inches. Strip 1/4-in. of insulation from each conductor. Cut the shield and drain wire from the sensor end of the cable.
3. Connect the sensor cable as follows:
   a. Install a jumper between the two center terminals (SEN and SET).
   b. Remove the existing factory-connected wire on terminal T1 of the control module.
   c. Connect one wire from the cable (RED) to the T1 terminal on the controller. Connect the other end of the wire to the SEN terminal without the jumper wire.
   d. Connect another wire from the cable (BLACK) to the T10 terminal on the controller. Connect the other end of the wire to the remaining jumpered SEN terminal.
   e. Connect the remaining wire (WHITE/CLR) to the T9 terminal on the controller. Connect the other end if the wire to the remaining open terminal on the SET terminal block.
   f. In the control box, install a no. 6 ring type crimp lug on the shield drain wire. Install this lug under the mounting screw in the upper right corner of the controller (just above terminal T1).

WIRING THE CCN NETWORK COMMUNICATION SERVICE JACK — To wire the service jack, perform the following:

1. Strip back the jacket from the CCN communication cable(s) for at least 3 inches. Strip 1/4-in. of insulation from each conductor. Remove the shield and separate the drain wire from the cable. Twist together all the shield drain wires and fasten them together using a closed end crimp lug or a wire nut. Tape off any exposed bare wire to prevent shorting.
2. Connect the CCN + signal wire(s) (RED) to Terminal 5.
3. Connect the CCN – signal wire(s) (BLACK) to Terminal 2.
4. Connect the CCN GND signal wire(s) (WHITE/CLR) to Terminal 4. Before wiring the RJ11 plug refer to Carrier Comfort Network® Interface, page 38 for communication bus wiring and cable selection. The cable selected must be identical to the CCN communication bus wire used for the entire network.

   The other end of the communication bus cable must be connected to the remainder of the CCN communication bus. If the cable is installed as a T-tap into the bus, the cable length cannot exceed 100 ft. Wire the CCN service jack of the sensor in a daisy chain arrangement with other equipment. Refer to Carrier Comfort Network Interface section, page 38 for more details.

LINKAGE THERMOSTAT (Field-Installed Accessory) — The linkage thermostat can be used to control multiple units (up to 8 different sizes and types) from a single thermostat, provide occupancy scheduling for any number of units (all operating on the same schedule), and broadcast the changeover switch status (2-pipe systems) to all units in the system (Fig. 19). The thermostat is equipped with two liquid crystal displays (LCD). One LCD is used to display the set points, space temperature, unit operating mode (Heating, Cooling, Off, etc.), and discharge air temperature from the unit. The second LCD displays the time and day of the week. The thermostat has pushbutton keys to enter the temperature set points, program the occupancy schedule, program holidays, set time, day, and date, and configure the functionality of the device.

When the thermostat provides local occupancy and set point scheduling for these units, it provides a Temperature Compensated Start feature which starts the unit(s) prior to the scheduled occupied time in order for the space to achieve the occupied set point temperature at the occupied time.

The thermostat uses CCN communications to provide the required information exchange between the thermostat and the unit's controls.

The thermostat can be used to provide global occupancy scheduling for any number of units when a CCN user interface is not provided. In this mode, a 3-wire communication bus connected between each unit and the thermostat allows a user to program and change equipment occupancy scheduling and holidays from a single location without requiring the use of a personal computer. This allows any number of unit ventilators equipped with the Unit Ventilator Comfort Control module to operate to a common occupancy schedule (all controllers must be connected to a single CCN communication bus). Each Unit Ventilator Comfort Control module will use its own set points and space temperature settings.

The linkage thermostat can broadcast the value of an equipment status point to all units connected to the communication bus. The point name must be configured using a CCN Service Tool at installation. A typical example is to broadcast the status of the changeover switch (2-pipe systems) or a field-supplied and field-installed outdoor-air enthalpy sensor from the one unit where the sensor is installed to all other units. This action reduces the installation cost and operating maintenance of the entire system.

When used to provide Global Occupancy Scheduling or Broadcast, the thermostat does NOT need to be mounted in any specific space. The thermostat can be mounted anywhere in a conditioned area as long it is connected to the CCN communication bus.

The linkage feature allows several units to operate from a single common thermostat. This feature can be used if multiple units serve a single common area. The thermostat must be mounted in the common area space for this feature.

Thermostat Mounting Location — DO NOT mount the sensor in drafty locations (such as near air conditioning or heating ducts), over heat sources (such as baseboard heaters or radiators), or directly above wall mounted-lighting dimmers. DO NOT mount the sensor near a window which may be opened, near a wall corner, or near a door.

Sensors mounted in these areas will have inaccurate and erratic sensor readings. The sensor should be mounted approximately 5 ft from the floor, in an area representing the average temperature in the space. Allow at least 4 ft between the sensor and any corner and mount the sensor at least 2 ft from an open doorway. Follow the mounting and wiring instructions included with the thermostat for proper thermostat installation.

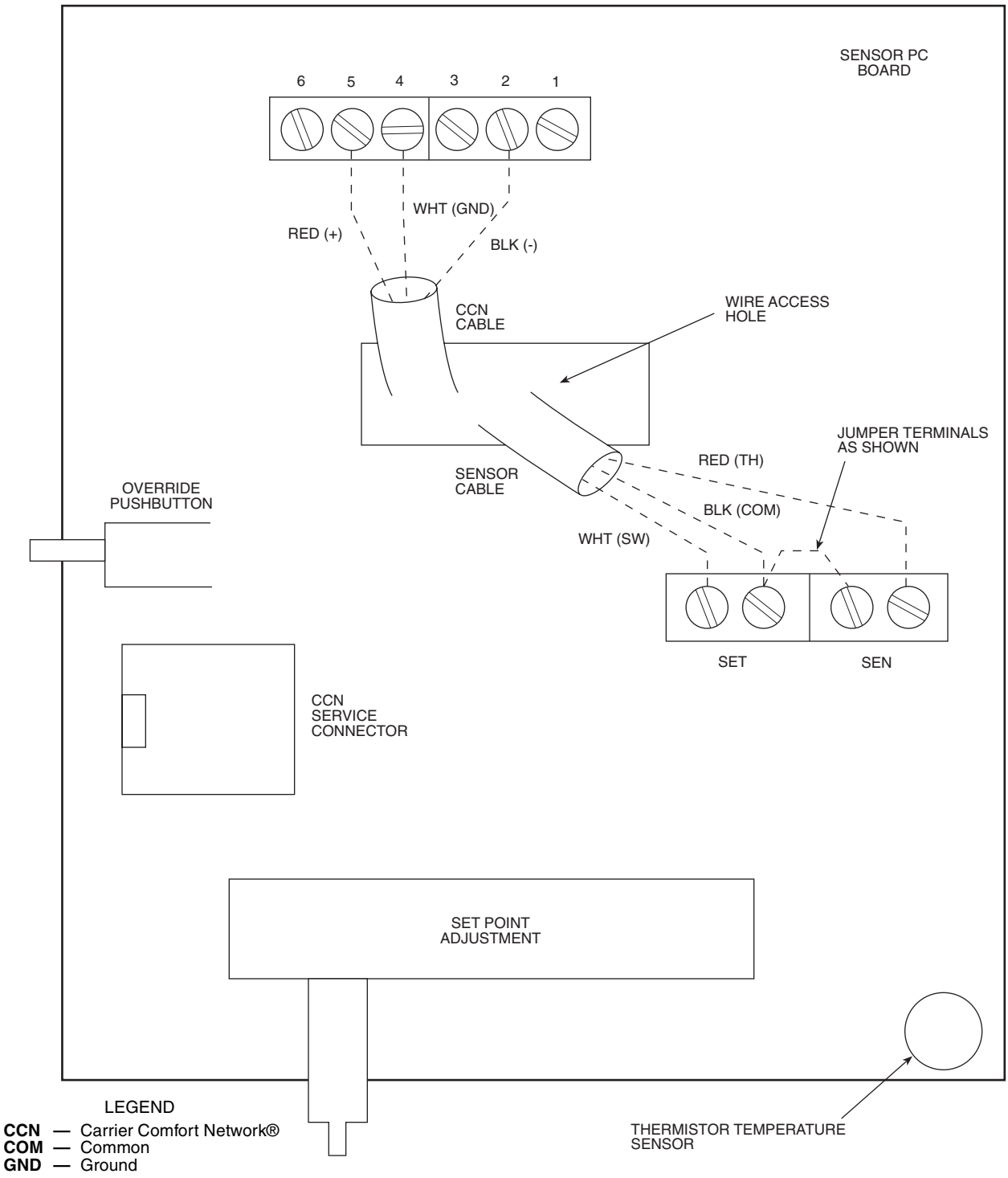


Fig. 18 — Space Temperature Sensor Wiring

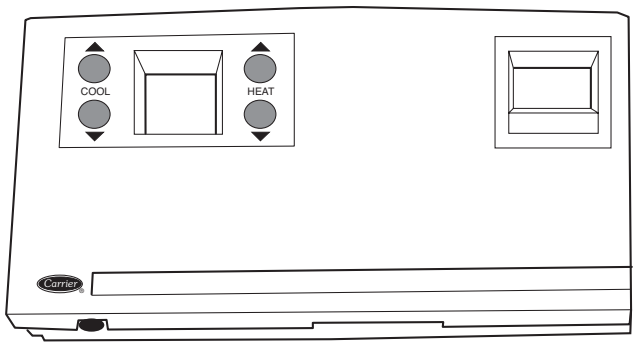


Fig. 19 — Linkage Thermostat

Thermostat Power Supply — The thermostat power supply, included in the accessory package, provides the required DC voltage to operate the thermostat. The power supply includes 24 vac (Class II) transformer.

The transformer and power supply can be mounted within the unit's control enclosure.

Wiring between the thermostat and the power supply is limited to 100 ft maximum. If longer distances are required, the power supply and transformer must be remotely mounted closer to the thermostat. Be sure to follow all code requirements when remotely mounting the transformer as the primary wiring is Class I circuit type. The thermostat power wiring requires the use of a 2-conductor, 18 AWG, twisted pair cable to connect the power supply output terminals to the thermostat. Follow the installation instructions shipped with the thermostat for proper installation.

Thermostat Communication Wiring — The thermostat uses CCN network communications to exchange data between the thermostat and the equipment control or the CCN network for system functions. Use 3-conductor, 20 AWG (American Wire Gage) minimum, shielded cable as specified in the Carrier Comfort Network® Interface section. See Table 14.

Thermostat Remote Room Sensor Option — The installer has the option of mounting the thermostat in a mechanical closet or other location in order to limit access to the device. A remote sensor option can be installed in the space to properly sense temperature at the occupied location. Refer to the installation instructions shipped with the thermostat for additional information on this option.

Table 14 — CCN Cable Requirements

MANUFACTURER	CABLE NO.
Alpha	2413 or 5463
American	A22503
Belden	8772
Columbia	02525

INDOOR AIR QUALITY (IAQ) SENSOR (Field-Installed Accessory) — The wall-mounted sensor monitors CO_2 in the conditioned air space, and uses infrared technology to detect the levels of CO_2 present in the air. See Fig. 20. This information is used to modify the position of the outdoor-air dampers to admit more outdoor air as required to provide the desired ventilation rate. The sensor is available with or without an LCD readout to display the CO_2 level in ppm. Sensor accessory descriptions and part numbers are shown in Table 15. To mount the sensor, refer to the installation instructions shipped with the accessory kit.

Table 15 — Indoor Air Quality Sensor Accessories

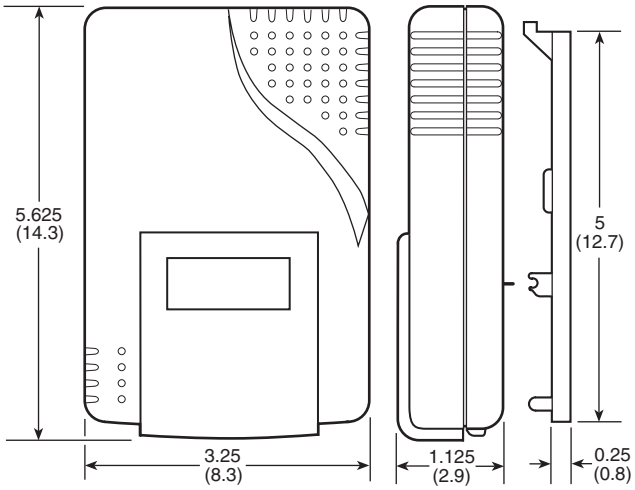
CO_2 SENSOR ACCESSORY PART NUMBERS	DESCRIPTION
CGCDXSEN001A00	Wall Mount Sensor (No Display)
CGCDXSEN002A00	Wall Mount Sensor with Display
CGCDXGAS001A00	Sensor Calibration Service Kit

The CO_2 sensors in Table 15 are all factory set for a range of 0 to 2000 ppm and a linear voltage output of 2 to 10 vdc. Fig. 21 shows ventilation rates for various CO_2 set points when a typical CO_2 level of 350 ppm is used. Refer to the instructions supplied with the CO_2 sensor for electrical requirements and terminal locations. A separate isolated field-supplied transformer is required to provide power to the sensor.

Any changes to the factory configuration of the sensor require use of the User Interface Program (UIP), which is included in the sensor calibration service kit.

The sensor must be properly located to accurately measure the air quality of the occupied space. It should be mounted in a location that will avoid direct breath contact.

Do not mount the sensor in drafty areas such as near the unit discharge, open windows, fans, or over heat sources. Allow at least 3 ft between the sensor and any corner. Avoid mounting the sensor where it is influenced by the supply air; the sensor gives inaccurate readings if supply air is blown directly onto the sensor.



NOTE: Dimensions are in inches.
Dimensions in ( ) are in centimeters.

Fig. 20 — Indoor Air Quality (CO_2) Sensor (PN 33ZCSENCO2)

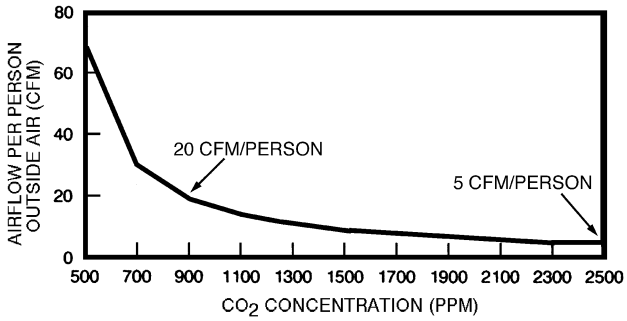
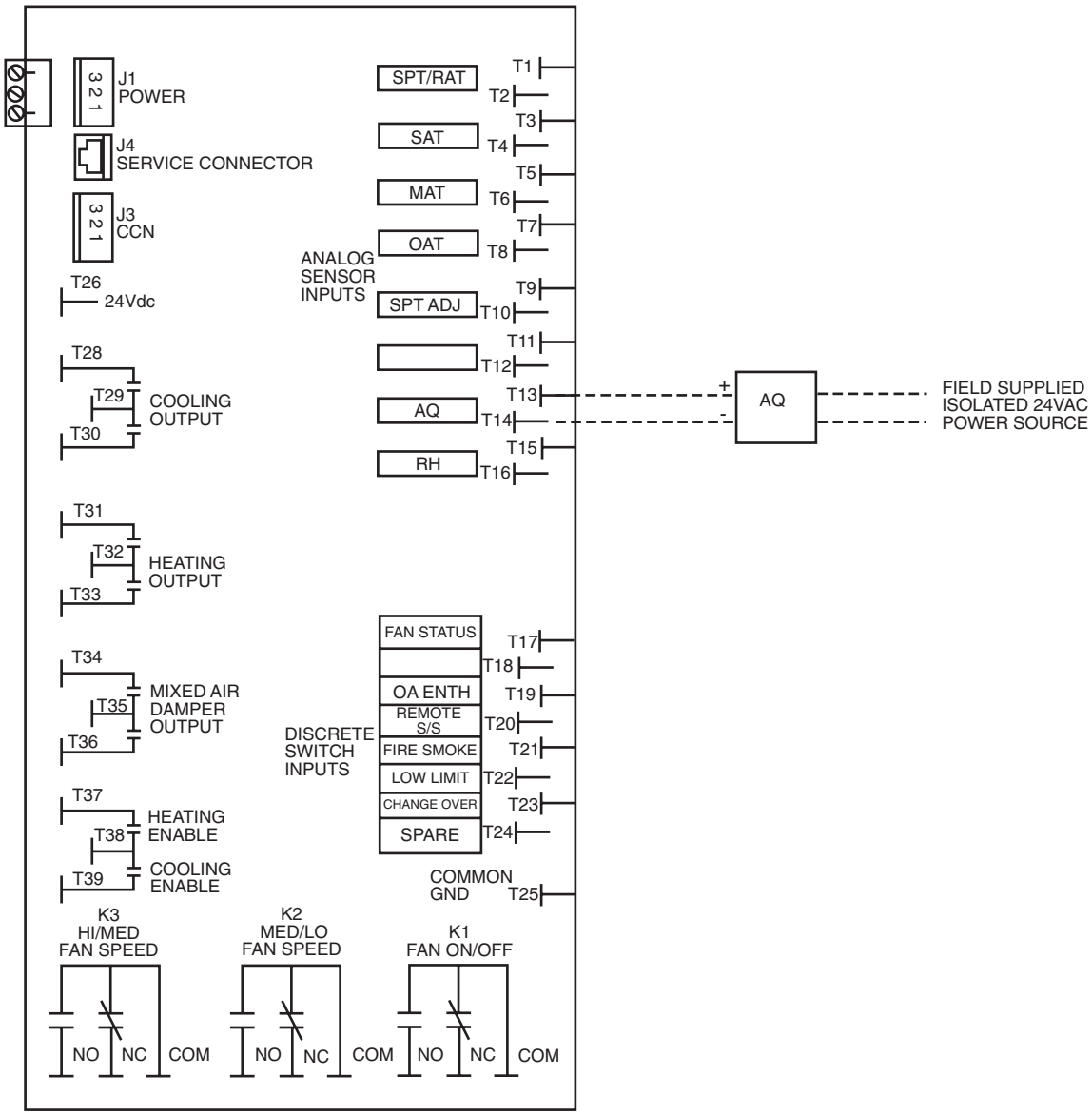


Fig. 21 — Ventilation Rates Based on CO_2 Set Point

Air Quality Sensor Wiring — To wire the sensor after it has been mounted in the conditioned space, see Fig. 22 and the installation instructions shipped with the sensor. For each sensor, use 2-conductor 18 AWG twisted-pair cables (unshielded) to connect the separate isolated 24 vac power source to the sensor and to connect the sensor to the control board terminals.

To connect the sensor to the control board, identify the positive (+) and negative (–) output terminals to the sensor terminal block and connect the positive terminal to terminal T13. Connect the negative terminal to terminal T14 on the control board. Mount a field-supplied Class II, 24 vac transformer with a 40 va rating in a suitable location inside the unit's control box. Wire the transformer primary to line voltage power after any fuses and disconnect switches. Ensure the transformer primary voltage rating matches the unit's voltage rating. Refer to the wire label diagram shipped with the unit. Connect one of the transformer secondary leads to the 24 vac power terminal of the sensor. Connect the remaining secondary lead to the ground terminal sensor.



LEGEND

ADJ	— Adjust	**NC**	— Normally Closed
AQ	— Air Quality	**NO**	— Normally Open
CCN	— Carrier Comfort Network®	**RAT**	— Return-Air Temperature Sensor
COM	— Common	**S/S**	— Start/Stop
GND	— Ground	**SAT**	— Supply-Air Temperature Sensor
MAT	— Mixed-Air Temperature Sensor	**SPT**	— Space Temperature Sensor
OA ENTH	— Outdoor-Air Enthalpy	**RH**	— Relative Humidity
OAT	— Outdoor-Air Temperature Sensor		

Fig. 22 — Air Quality Sensor Wiring

RELATIVE HUMIDITY SENSOR (Field-Installed Accessory) — The relative humidity (RH) sensor is used to measure the relative humidity of the air within the occupied space. The sensor is ordered separately from the unit, is field-installed and should be wired in the control compartment below the control module. It may be mounted directly on an interior wall if acceptable by local codes. See Fig. 23.

The sensor uses bulk polymer resistance technology, which eliminates the effect of surface contamination and helps to maintain sensor accuracy over a long period of time. It has a long-term stability of less than 1% drift per year.

The relative humidity sensor has a range of 10 to 90% with an accuracy of ±3% at 77 F. It generates a 2 to 10 vdc signal which is sent to the controller.

If the sensor is installed directly on a wall surface, install the humidity sensor using 2 screws and 2 hollow wall anchors (field-supplied); *do not overtighten screws*. See Fig. 17. The use of a standard 2 x 4-in. electrical box to accommodate the wiring is recommended for installation.

⚠ CAUTION

DO NOT touch the sensing element or clean with chemical solvents; they can permanently damage the sensor.

The sensor must be mounted vertically on the wall. The Carrier logo should be oriented correctly when the sensor is properly mounted.

DO NOT mount the sensor in drafty areas such as near the unit's discharge grille, open windows or fans, or over heat sources such as baseboard heaters, radiators, or wall-mounted light dimmers. Sensors mounted in those areas will produce inaccurate readings.

Avoid corner locations. Allow at least 4 ft between the sensor and any corner. Airflow near corners tends to be reduced, resulting in erratic sensor readings.

Sensor should be vertically mounted approximately 5 ft up from the floor.

For distances up to 500 feet, use a 3-conductor shielded, 20 AWG cable. A CCN communication cable can be used. The shield and drain wire must be removed from the sensor end of the cable. See Fig. 24 for wiring details.

The power for the sensor is provided by the control board. The board provides 24 vdc for the sensor. No additional power source is required.

To wire the sensor, perform the following:

1. At the sensor, remove 4-in. of jacket from the cable. Strip 1/4-in. of insulation from each conductor. Route the cable through the wire clearance opening in the center of the sensor. See Fig. 24.
2. Connect the RED wire to the sensor screw terminal marked (+).
3. Install one lead from the resistor (supplied with the sensor) and the WHITE wire, into the sensor screw terminal marked (–). After tightening the screw terminal, test the connection by pulling gently on the resistor lead.
4. Connect the remaining lead from the resistor to the BLACK wire and secure using a closed end type crimp connector or wire nut.
5. Using electrical tape, insulate any exposed resistor lead to prevent shorting.
6. At the control end, remove the jacket from the cable and route the RED conductor over to the left side of the control board. Route the remaining conductors to the right side of the control board.
7. Strip 1/4-in. of insulation from each conductor and equip each with a 1/4-in. female quick connect terminal.
8. Connect the RED wire to terminal T26 on the control board.
9. Connect the BLACK wire to terminal T16 on the control board.
10. Connect the WHITE/CLEAR wire to terminal T15 on the control board.
11. Equip the shield wire with a no. 8 fork-type lug and secure to the control module mounting screw between terminals T16 and T17.

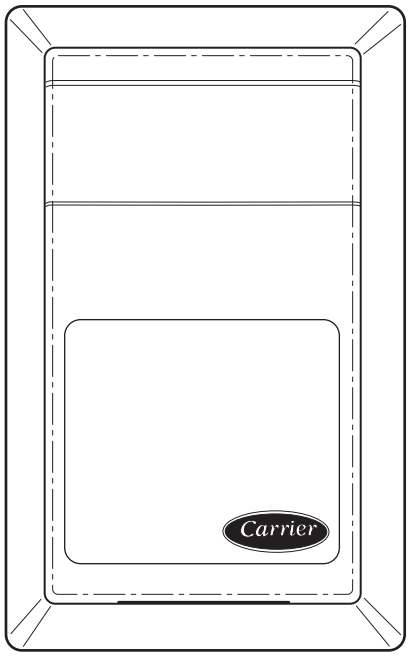
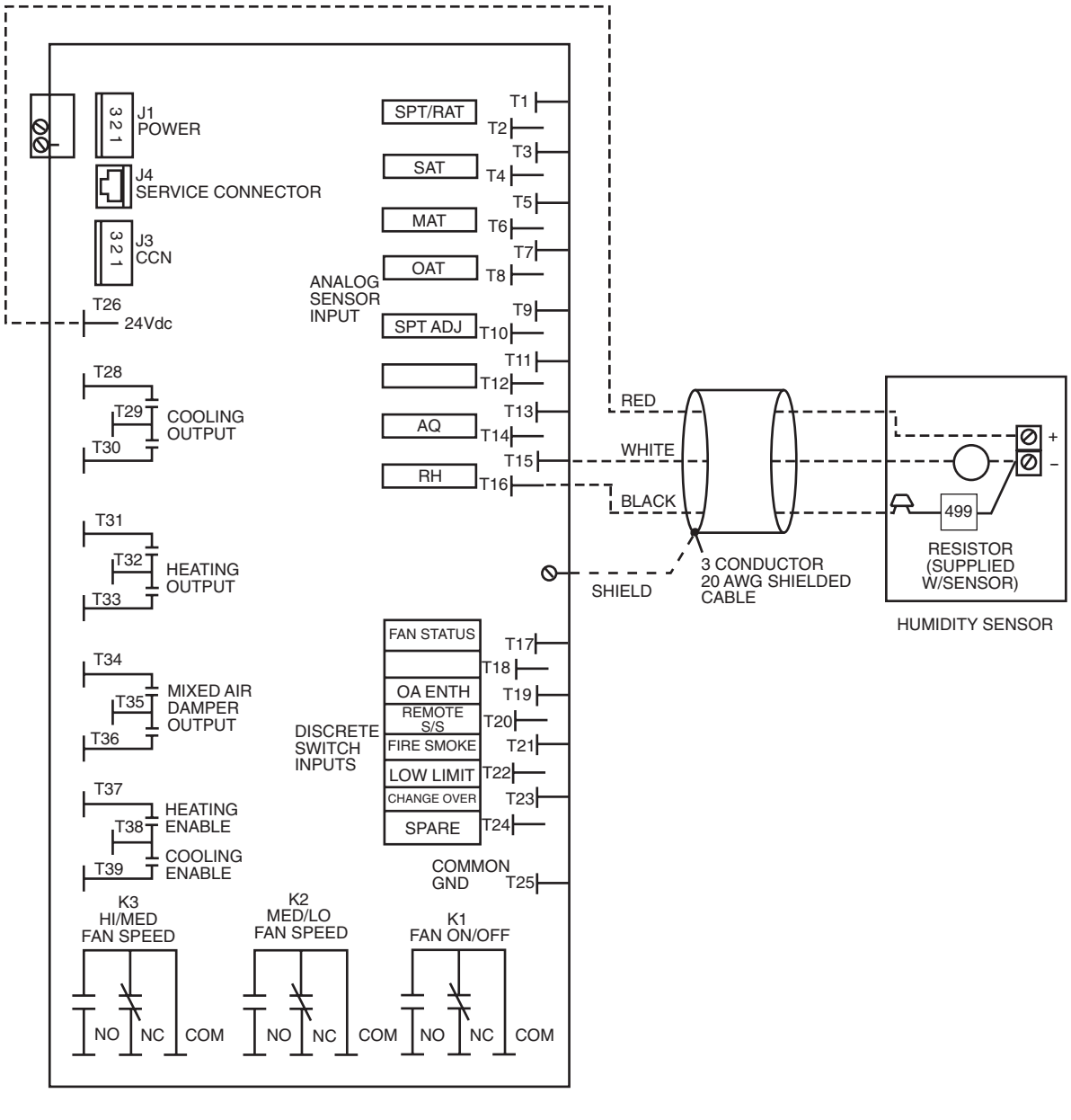


Fig. 23 — Wall-Mounted Relative Humidity Sensor (Part No. HL39ZZ003)



LEGEND

ADJ	— Adjust	**NC**	— Normally Closed
AQ	— Air Quality	**NO**	— Normally Open
CCN	— Carrier Comfort Network®	**RAT**	— Return-Air Temperature Sensor
COM	— Common	**S/S**	— Start/Stop
GND	— Ground	**SAT**	— Supply-Air Temperature Sensor
MAT	— Mixed-Air Temperature Sensor	**SPT**	— Space Temperature Sensor
OA ENTH	— Outdoor-Air Enthalpy	**RH**	— Relative Humidity
OAT	— Outdoor-Air Temperature Sensor		

Fig. 24 — Wiring of Relative Humidity Sensor to Control Board

CHANGEOVER SWITCH (Factory-Installed Option) — The changeover switch is used with 2-pipe changeover units to determine if the temperature of the water in the water loop can provide cooling or heating (Fig. 25). The switch provides this input to the control. The changeover switch is factory-wired to the control and ready for field mounting to the water piping. The switch mounts to the water pipe using a spring-loaded clamp.

It is primarily used for a stand-alone application, although the changeover switch may be required for CCN applications if the water temperature status is not available through the network. For stand-alone applications, one switch is required for each 2-pipe unit. If the units are connected together on a 3-wire CCN communication bus and a linkage thermostat (or Unit Ventilator Comfort Control module [P/N 110500]) is used, then a single switch can be connected to any one unit and the linkage thermostat can be configured to broadcast the switch status to all other units.

IMPORTANT: The switch must be mounted on the supply water pipe, where water flows continuously to accurately sense the available water temperature. Never mount the sensor on piping which is connected to a 2-way valve.

FILTER/SMOKE STATUS (CCN Systems Only) — The filter/smoke status is monitored by the control module and contains an adjustable alarm limit. The control accumulates fan-operating hours; when the total hours exceed the limit, an alarm is generated.

The alarm limit is adjustable from 100 to 9900 hours. It is factory preset to 1500 operating hours. The limit is normally field adjusted and is dependent on the filter media used as well as the quality and amount of outdoor air required. The normal range is from 400 to 1500 hours.

Carrier Comfort Network® Interface — The Carrier Comfort Network (CCN) communication bus wiring is supplied and installed by the electrical contractor. It consists of shielded, 3-conductor cable with drain wire.

The system elements are connected to the communication bus in a daisy-chain arrangement. The positive pin of each system element communication connector must be wired to the positive pins of the system element on either side of it; the negative pins must be wired to the negative pins; the signal ground pins must be wired to signal ground pins. See Fig. 26 for location of the CCN communication connector (NETWORK) on the control module.

NOTE: Conductors and drain wire must be 20 AWG minimum, stranded tinned copper. Individual conductors must be insulated with PVC, PVC/nylon, vinyl, Teflon, or polyethylene. An aluminum/polyester 100% foil shield and an outer jacket of PVC, PVC/nylon, chrome vinyl, or Teflon with a minimum operating temperature range of –20 C to 60 C is required. See Table 14 for cables that meet the requirements.

When connecting the CCN communication bus to a system element, a color code system for the entire network is recommended to simplify installation and checkout. The following color code is recommended:

SIGNAL TYPE	CCN BUS CONDUCTOR INSULATION COLOR	CCN CONNECTOR
+	RED	1
Ground	WHITE	2
–	BLACK	3

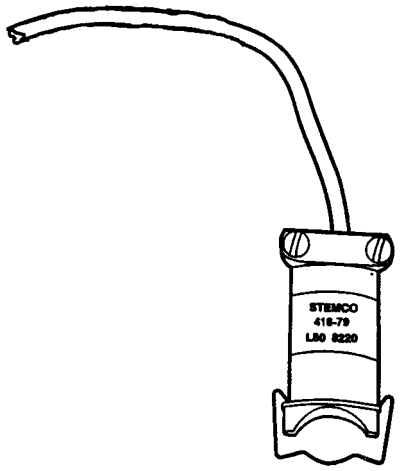


Fig. 25 — Changeover Switch

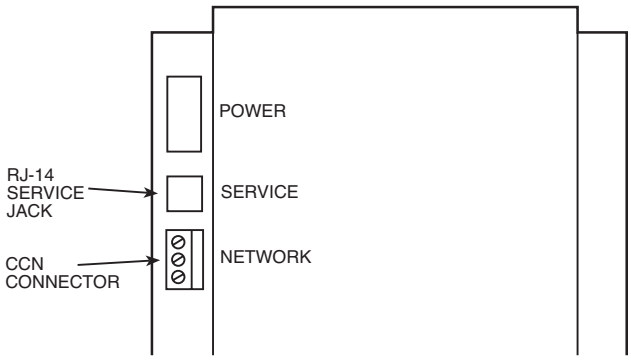


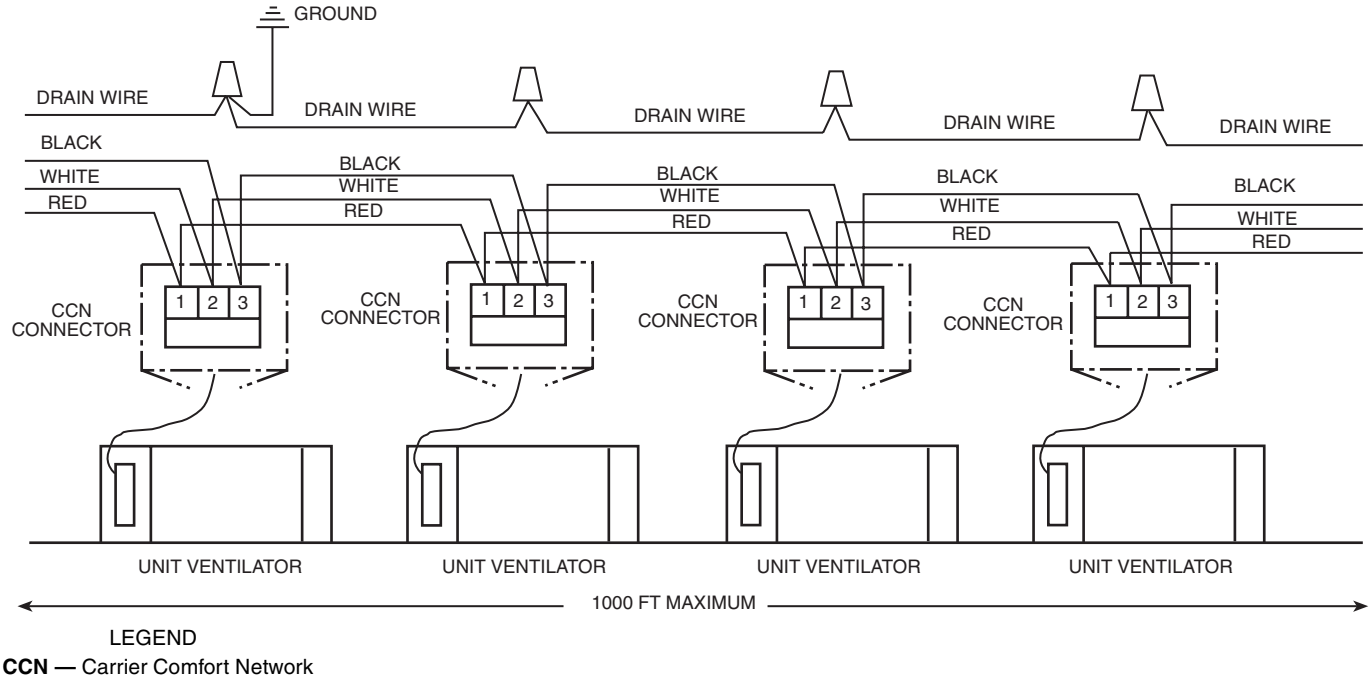
Fig. 26 — CCN Communication Connector

If a cable with a different color scheme is selected, a similar color code should be adopted for the entire network.

At each system element, the shields of its communication bus cables must be tied together. If the communication bus is entirely within one building, the resulting continuous shield must be connected to ground at only one point. See Fig. 27. If the communication bus cable exits from one building and enters another, the shields must be connected to ground at the lightning suppressor in each building where the cable enters or exits the building (one point only).

To connect the control to the network, proceed as follows (Fig. 27):

1. Turn power to the control box OFF.
2. Remove the CCN connector from the control board.
3. Cut the CCN wire and strip the ends of the RED, WHITE, and BLACK conductors.
4. Using a wire nut, connect the 2 drain wires together.
5. Insert and secure the 2 RED wires to terminal 1 of the CCN connector.
6. Insert and secure the 2 WHITE wires to terminal 2 of the CCN connector.
7. Insert and secure the 2 BLACK wires to terminal 3 of the CCN connector.
8. Replace connector on control board.
9. Turn on power to control box.



LEGEND

CCN — Carrier Comfort Network

Fig. 27 — CCN Communication Wiring

Relays — The fan relays are an integral component of the control board. The fan motor speed control uses three SPDT relays. The control relays are shown in Fig. 24. See the following sections for a description of how the control relay is used with each function.

FAN RELAY — The fan relay (K_1) is factory-wired and factory-installed on all units. The relay interfaces with the Electronically Commutated Motor (ECM) motor control circuit and automatically starts and stops the fan.

FAN SPEED RELAYS — The fan speed relays, K_2 and K_3, select the operating speed of the fan (High/Medium/Low). The fan speed relays are factory-wired and factory-installed. These relays control the speed of the motor.

Actuators

MODULATING OUTDOOR-AIR DAMPER ACTUATOR (Fig. 28) — The outdoor-air damper actuator is factory-supplied and factory-installed directly on the damper jackshaft. All wiring between the actuator and the control is provided by the factory. The actuator is mounted so that the spring return will close the outdoor-air damper and open the return-air damper on loss of power.

The actuator consists of an electronically controlled reversible motor equipped with a microprocessor drive. The damper actuator is supplied with approximately 8 ft of plenum rated cable.

The actuator is capable of holding its position at any point in the stroke and moving the damper in either direction.

The actuator is powered by the fused 24 vac transformer located in the control box.

FACE AND BYPASS DAMPER ACTUATOR (Fig. 29) — The actuator provides 35 in.-lb torque rating and is powered by the 24-vac transformer located in the control box.

Face and bypass dampers are factory-supplied and factory-installed on all face and bypass damper applications. These actuators are proportional modulating, direct shaft mount type, capable of being driven in either direction and holding position at any point in the travel range.

The actuators are supplied with plenum rated cable.

Actuator connections depend on the application. Refer to Application Data manual and wire label diagram for wiring information.

The actuator is equipped with a SPDT damper end switch, which senses when the damper is in the full bypass position. The switch position is adjusted so that the switch closes when the damper moves about 5 degrees from the full bypass position.

FIELD-SUPPLIED TWO-POSITION RELIEF DAMPER — A field-supplied relay is required to wire a field-supplied two-position damper or ventilation unit, such as a heat recovery ventilator (HRV) or energy recovery ventilator (ERV) to the control module. A SPST normally open relay, such as HB61KK324, must be field-installed and wired for use with the field-supplied damper actuator or ventilation unit.

Using 18 AWG twisted cable, connect the relay coil contacts to the control terminals J1-2 and T34. See Fig. 24 and 30.

To connect a field-supplied two-position damper actuator, (Fig. 30), connect one contact of the actuator to the normally open contact of the relay. Connect the common contact of the relay to one leg of the power source. Connect the other contact of the actuator to the outer leg of the power source.

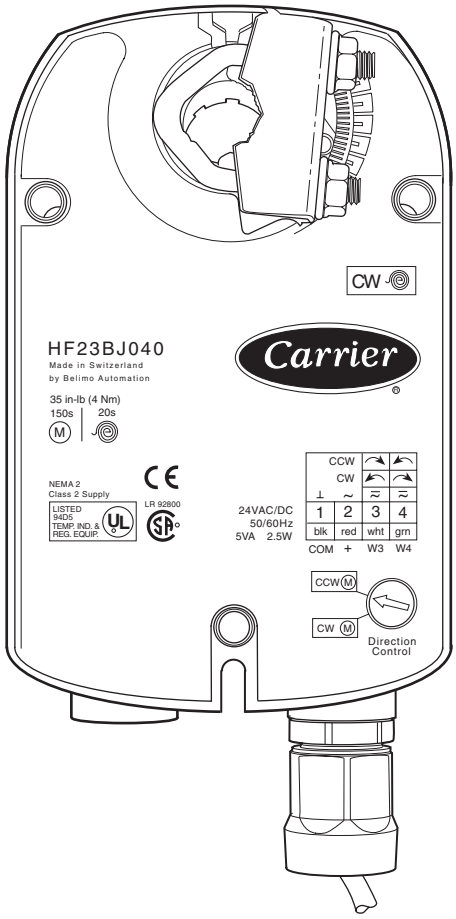


Fig. 28 — Modulating Outdoor-Air Damper Actuator (Part No. HF23BJ040)

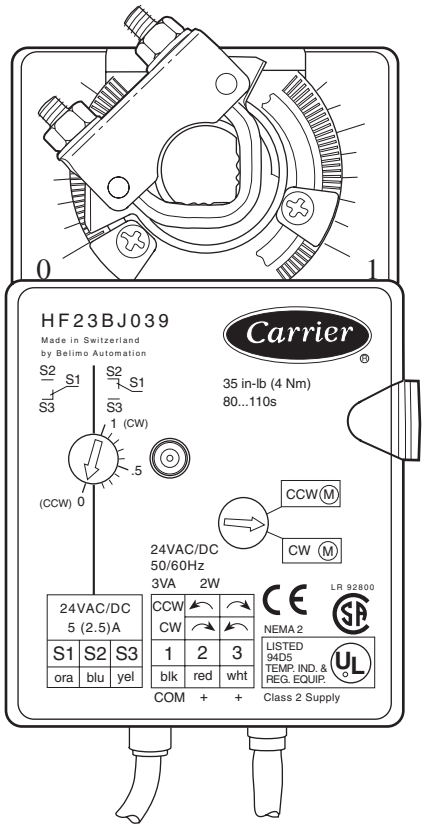
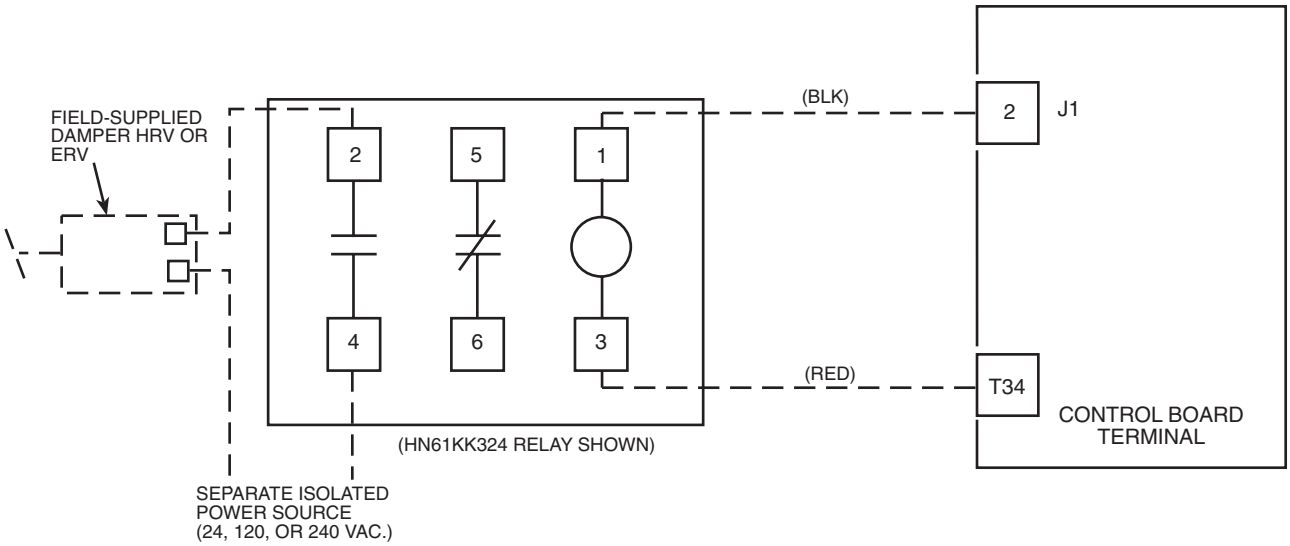


Fig. 29 — Face and Bypass Damper Actuator (Part No. HF23BJ039)



LEGEND

ERV — Energy Recovery Ventilator
HRV — Heat Recovery Ventilator
- - - - Field Wiring

Fig. 30 — Two-Position Minimum Outdoor-Air Damper Relay

Direct Expansion (DX) Cooling — The Unit Ventilator Comfort Control module is designed to provide up to 2 stages of capacity control for direct expansion (DX) cooling applications. The control can be interfaced with condensing units, unloader solenoid valve, hot gas bypass valves, and liquid line solenoid valves. In these applications, the stages of DX capacity are controlled to maintain the space temperature at the cooling set point. Typically, compressor stages and liquid line solenoid valves operate normally open, while unloaders and hot gas bypass valves operate normally closed (see Fig. 31).

The Unit Ventilator Comfort Control module provides a SPDT relay contact for the first stage of DX cooling. These contacts are designed to switch up to 1 ampere of power (24 to 277 vac at 60 Hz).

Each DX output is configured to provide a minimum off time of 5 minutes after being deenergized. This Time Guard control feature allows the refrigerant pressures to equalize after a compressor shutdown, thereby protecting compressors from damage caused by starting with excessive loads. The Time Guard control can be disabled if the stage is used to control a solenoid valve or unloader.

OUTDOOR-AIR TEMPERATURE (OAT) LOCKOUT — An outdoor-air temperature lockout is provided to disable all DX cooling. The control compares the outdoor-air temperature to the user-adjustable DX outdoor air lockout set point. Whenever the OAT drops below the set point, all stages of DX cooling are disabled.

The outdoor-air lockout feature is used to ensure the condensing unit does not operate below its designed minimum outdoor temperature.

DX System Design — Recommendations for basic DX system design and piping should always be followed and are available in the Carrier System Design manual.

The Unit Ventilator Comfort Control module maintains the space temperature at the cooling set point by operating the DX stages as the space load requires. Configuration requirements for systems using DX components vary according to the system design.

IMPORTANT: Never oversize the condensing unit.

For units equipped with CCN controls, condensing units should be sized for medium speed airflow unless a hot gas bypass valve or two-stage condenser is supplied.

Several staging control examples for typical DX applications are shown in Examples 1-3. Use a service configuration tool to configure the number of stages and the logic type and Time Guard control features. See Set-Up, Configuration and Operation section on page 46 for further configuration details.

Example 1 — Single-Stage Single Condensing Unit

STAGE NUMBER	STAGE TYPE	LOGIC TYPE	TIME GUARD FUNCTION
1	Compressor	Normal	Enabled
2	Hot Gas	Inverted	Disabled

Example 2 — Two-Stage Single Condensing Unit

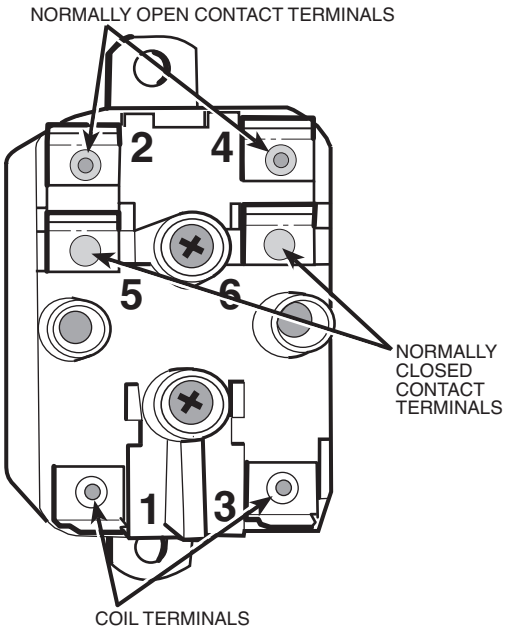
STAGE NUMBER	STAGE TYPE	LOGIC TYPE	TIME GUARD FUNCTION
1	Compressor	Normal	Enabled
2	Electric Unloader no. 1*	Inverted	Disabled

*Optional, based on the system design or hot gas bypass.

Example 3 — Condensing Unit with Two-Speed Compressor

STAGE NUMBER	STAGE TYPE	LOGIC TYPE	TIME GUARD FUNCTION
1	Compressor or Low Speed	Normal	Enabled
2	Compressor or High Speed	Normal	Enabled

The preceding examples are typical; however, staging for each system is unique. Staging is for capacity control only and does not eliminate any components required for safety or by recommended system design. Follow equipment application and installation instructions for sizing, location of electrical connections, and required components such as liquid-line solenoid valves used for refrigerant isolation, and thermostatic expansion valves.



RELAY CONTACT RATINGS

48 va at	24 vac	0.25 power factor
125 va at	115 vac	0.25 power factor
230 va at	230 vac	0.25 power factor

Fig. 31 — DX Control Relay (Part No. HN61KK324)

Electric Heat — Two control relays are factory-supplied, factory-installed and factory-wired to provide staging control for electric heater applications. They are used to operate the electric heater elements in two stages. The relays are installed inside the electric heat control compartment. The heater circuit connections depend upon the actual number of heater elements provided. The Unit Ventilator Comfort Control module provides two stage electric heat control capability unless only one element is provided.

The control operates the heater stages as required, but prevents the discharge air temperature from exceeding 140 F at any time.

The first stage is wired so that it operates between 33 to 50 percent of the total heater capacity. Refer to Table 16 for heater element circuit connections.

Remote Start — The remote start input is used to switch the control operating mode from the unoccupied to the occupied state by means of a contact closure from an external control system or an electro-mechanical time clock device. The control device must provide an isolated single-pole contact. Whenever the contact is closed and 24 vac is present on T20, the control will operate in the Occupied mode.

Using 18 or 20 AWG wire, connect the remote start terminal (T20) to one side of the remote contact. Connect the other side of the contact to TB.

If a solid-state contact is provided by the control device, then a field-supplied and field-installed load resistor may be necessary to ensure reliable operation of the input. To ensure proper operation, use a digital volt meter (DVM) and measure the AC voltage between T20 and T25 with the external contact in the OFF or open position.

The input will operate properly if the AC voltage is less than 1 vac, otherwise a load resistor must be connected across terminals T20 (remote start input) and T25 (ground). Typically, a single 1000 ohm, 2 watt resistor will reduce the voltage sufficiently for most solid-state contacts. If not, add additional resistors, one at a time, until the voltage measured is below 1 vac. Because the resistors heat when operating, the devices should be permanently mounted to a field-supplied terminal strip and 20 AWG wire rated for at least 90 C should be used to connect the resistor(s) to control terminals T20 and T25.

Fire/Smoke Status Input — The Fire/Smoke Status Input is used to identify that a fan has stopped its normal operation due to an alarm condition at a local fire or smoke detector. This input must be used in conjunction with a normally closed contact which is wired into the fan motor control circuit.

A double-pole double-throw (DPDT) relay, part number HN61KK324, is recommended. One set of the relay contacts is wired into the fan motor circuit and the other set is wired to the control input. The control box provides 24 vac power for the relay. The relay is controlled by a separate isolated contact set from the smoke or fire detector.

All wiring from the detector should be appropriately rated for the application and must comply with NEC, NFPA (National Fire Protection Association) and any local codes.

SMOKE/FIRE DETECTOR WIRING (Normally Open Contact Set) — Perform the following procedure to wire the smoke/fire detector:

1. Use 15 AWG wire rated for 600 vac for all wiring. Eight $^1/_4$-in. insulated female quick-connect type lugs are required.
2. Connect a wire from TB to one of the detector contact terminals.
3. Connect the other detector contact terminal to the relay coil terminal no. 1.
4. Connect the other coil terminal, no. 3, to ground in the control box.
5. Connect the normally closed contact set (relay terminals no. 5 and no. 6) to the fan motor wiring as shown on the label diagram.
6. Connect one of the normally open relay contacts, terminal no. 2, to TB (24 vac).
7. Connect the other side of the contact, terminal no. 4, to T21 on the control module.

SMOKE/FIRE DETECTOR WIRING (Normally Closed Contact Set) — Perform the following procedure to wire the smoke/fire detector:

1. Use 15 AWG wire rated for 600 vac for all wiring. Eight $^1/_4$-in. insulated female quick-connect type lugs are required.
2. Connect a wire from TB to one of the detector contact terminals.
3. Connect the other detector contact terminal to the relay coil terminal no. 1.
4. Connect the other coil terminal, no. 3, to ground in the control box.
5. Connect the normally open contact set (relay terminals no. 2 and no. 4) to the fan motor wiring as shown on the label diagram.
6. Connect one of the normally closed relay contacts, terminal no. 5, to TB (24 vac).
7. Connect the other side of the contact, terminal no. 6, to T21 on the control board.

Table 16 — Heater Element Wiring

TOTAL NO. OF HEATER CIRCUITS	NO. OF CIRCUITS CONTROLLED BY STAGE 1	STAGE 1 CAPACITY (%)	NO. OF CIRCUITS CONTROLLED BY STAGE 2	STAGE 2 CAPACITY(%)
3	1	33	2	67
4	2	50	2	50
5	2	40	3	60
6	2	33	4	67

Valves

WATER VALVES — Water valve assemblies are shipped with the unit for field installation. All factory-supplied valves are fully modulating and capable of being positioned at any point within the travel range of the valve. Each valve is shipped complete with an actuator and any required linkage.

The equal percentage characteristics of the modulating valves provide close temperature control on heating, cooling or reheat unit ventilator coils.

In case of power failure, a return spring sends the valve to its normal position. The normal position is defined for each control sequence.

Water Valve Actuators — Water valve actuators are factory-mounted on factory-supplied valve assemblies. The valve and actuator assemblies are modulating spring return for all water and steam applications. Valves are factory supplied.

All valves use actuators with reversible electric motors. The control provides proportional control to the electric motor which receives a tri-state signal from the control.

All valves have a spring return feature that allows them to return to a normal positions (normally closed) upon loss of power.

All valve assemblies have electrically powered actuators. Each actuator is factory-wired and operates its valve through a linear stroke.

Each water valve actuator features a magnetic clutch to extend the life of the motor and gear train. A manual override lever and position indicator facilitates field setup.

⚠ CAUTION

To prevent electric shock and equipment damage, disconnect the power to the control before performing any work on valve assemblies.

On chilled water or hot water applications, the valve actuators can be mounted in any position above the center line of the valve body. For steam applications, mount the actuator above the centerline of the valve body and at least 45 degrees from vertical. This position prevents exposing the actuator to extreme heat. Refer to Fig. 32.

⚠ CAUTION

The manual positioning lever on all water valves should only be used when controller power is OFF. DO NOT attempt to move this lever when controller power is applied. If the position lever does not move freely for manual positioning when the power is off, remove the valve cover and push the solenoid plunger down using a small screwdriver inserted in the slot below the solenoid.

⚠ CAUTION

DO NOT install valve assembly where excessive moisture, corrosive fumes, and/or vibration are present.

INSTALL all 2-way valve assemblies so that they close against system flow. Proper flow direction is from inlet 'B Port' to outlet 'A Port'.

ALWAYS install 3-way mixing valve with 2 inlet flows and one outlet. Proper flow direction is: inlet 'B Port' to coil. Inlet 'A Port' to supply. "Common Port' to return. See Fig. 33.

Water Valve Wiring — Valve wiring is determined by the actual valve selected and the control sequence.

All valves are factory-wired to the control module and tested.

Water valve specifications and dimensions are found in Table 17 and Fig. 34.

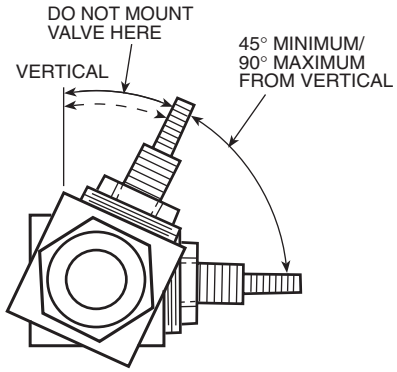


Fig. 32 — Valve Mounting Angle for Steam Heating Applications

Table 17 — Water Valve Specifications

FEATURE		SPECIFICATION
Application		Hot or Chilled Water, up to 50% Glycol
Fluid Temperature	**Minimum**	32 F (0° C)
	Maximum	200 F (93 C)
Flow Type		Equal % Service Port Linear Bypass (3-way only)
Static Pressure Limits		300 psi (20.7 bar)
Current Requirement (24 V Supply)		12 VA (in rush), 100 mA Continuous
Material	**Body**	Forged Brass
	Stem	Chrome-Plated Brass
	Seat	Stainless Steel
	Plug	High Temperature Thermoplastic
	Actuator	Stainless Steel Base, Aluminum Cover
Maximum Ambient Temperature and Humidity		125 F (52 C) 95% Non-Condensing
Actuator	**Voltage**	24 vac — 15%, +10% 50/60 Hz
	Power	12 VA inrush at 24 vac 2.5 VA holding
	Connections	Screw Terminals
Weight		3.0 lb (1360 g)

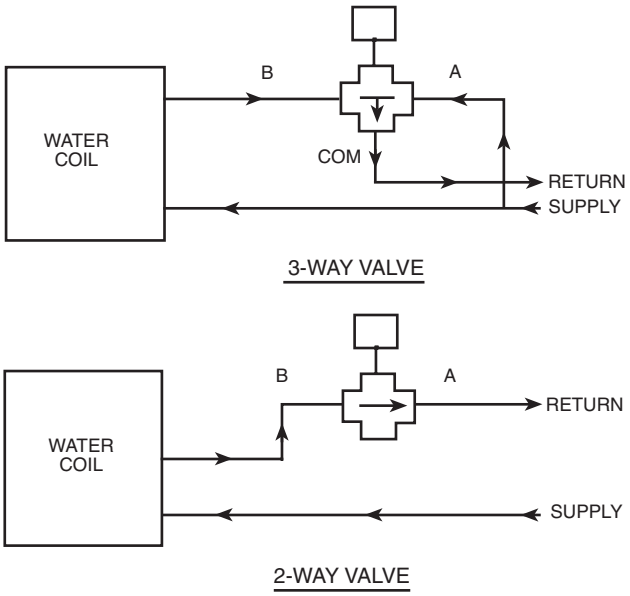
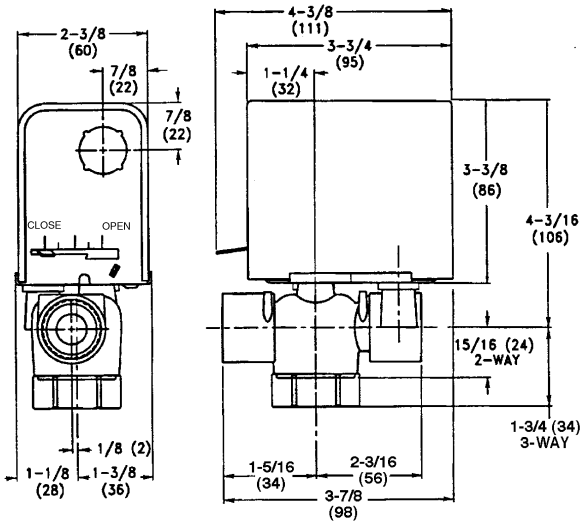


Fig. 33 — Typical Piping for Spring Return 2-Way and 3-Way Mixing Valves



NOTE: Dimensions are in inches (mm).

Fig. 34 — Water Valve Dimensions (Modulating Type)

The valve type is identified by the first digit of the two-digit control code number. In Table 18, the water valve type is shown for each unit depending on coil capacity.

For pressure drops other than those tested, see Table 19. See Tables 20 and 21 for close-off pressure.

Table 18 — Factory-Supplied Water Valves

CONTROL SEQUENCE	APPLICATION	VALVE APPLICATION	NORMAL POSITION
2A/3A	Chilled/Hot Water (Modulating Valve) Control	Chilled Water/ Hot Water	Open
2B/3B	Chilled Water Cooling, Hot Water or Steam Heating	Chilled Water Hot Water/Steam	Closed Open
2D/3D	Chilled Water Cooling, Electric Heat	Chilled Water	Open
2F/3F	Hot Water or Steam Heating Only	Hot Water/Steam	Open
2G/3G	Hot Water or Steam Heating, DX Cooling	Hot Water/Steam	Open
2J/3J	Chilled Water Cooling Only	Chilled Water	Open
2K/3K	Face and Bypass Chilled Water Cooling with Valve Control Heating	Chilled Water Reheat	Closed Open
2M/3M	Face and Bypass Chilled Water Cooling with Valve Control Reheat	Chilled Water Reheat Preheat	Closed Closed Open
20/30	Chilled Water/Hot Water Using Face and Bypass Damper Control	Chilled Water/ Hot Water	Open
21/31	Chilled Water Cooling, Hot Water or Steam Heating	Chilled Water Hot Water/Steam	Closed Open
22/32	Chilled Water Cooling, Electric Heat	Chilled Water	Open
23/33	Hot Water or Steam Heating, DX Cooling	Hot Water/Steam	Open
24/34	Hot Water or Steam Heating Only	Hot Water/Steam	Open
25/35	Chilled Water Cooling Only	Chilled Water	Open

LEGEND

DX — Direct Expansion

Table 19 — Valve and Coil Pressure Drops vs Flow

UNIT SIZE (NOMINAL CFM)	COIL ROWS	VALVE SUPPLIED (Cv)	TYPICAL VALVE AND COIL PRESSURE DROP	
			psi	gpm
500	1*	2.5	3.1	4
	2*	2.5	3.3	4
	3	2.5	3.3	4
	4	2.5	3.3	4
	5	2.5	3.3	4
750	1*	2.5	3.1	4
	2*	2.5	3.5	4
	3	2.5	3.3	4
	4	2.5	3.3	4
	5	2.5	3.3	4
1000	1*	2.5	3.6	4
	2*	2.5	3.5	4
	3	4.0	4	6
	4	4.0	4	6
	5	4.0	4	6
1250	1*	2.5	3.6	4
	2*	2.5	3.5	4
	3	4.0	6.7	8
	4	4.0	6.7	8
	5	4.0	6.7	8
1500	1*	2.5	3.6	4
	2*	2.5	3.8	4
	3	4.0	10.8	10
	4	4.0	10.8	10
	5	4.0	10.8	10
2000	1*	2.5	3.6	4
	2*	2.5	3.8	4
	3	4.0	10.8	10
	4	4.0	10.8	10
	5	4.0	10.8	10

LEGEND

Cv — Coefficient of Volume

*Hot water only.

NOTE: Desired Pressure Drop $= \left(\frac{\text{desired gpm flow}}{\text{flow from table}}\right)^2$

Table 20 — 2-Way Water Valve Specifications and Ratings

APPLICATION	FLOW COEFFICIENT VOLUME Cv	CLOSE-OFF PRESSURE PSI	NORMAL POSITION
Steam	1.3	35	OPEN
	2.2	35	OPEN
	4.4	35	OPEN
Hot/Chilled Water	2.5	50	OPEN
	4.0	35	OPEN
Chilled Water Only	2.5	50	CLOSED
	4.0	35	CLOSED

LEGEND

Cv — Coefficient of Volume

Table 21 — 3-Way Water Valve Specifications and Ratings

APPPLICATION	FLOW COEFFICIENT VOLUME Cv	CLOSE-OFF PRESSURE PSI	NORMAL POSITION (COIL)
Hot/Chilled Water	2.5	50	OPEN
	4.0	35	OPEN
Chilled Water Only	2.5	50	CLOSED
	4.0	35	CLOSED

LEGEND

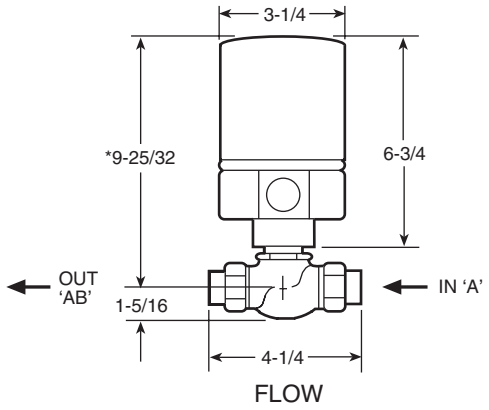
Cv — Coefficient of Volume

2-WAY STEAM VALVES — All steam valves utilize an electrically driven hydraulic actuator which provides a full modulating capability and a return feature. Each steam valve is factory-equipped with a spring linkage extension to prevent any actuator damage due to high steam temperatures. Steam valve specifications and dimensions are found in Table 22 and Fig. 35.

Table 22 — 2-Way Valve Specifications

Application		Steam
Fluid Temperature	Maximum	281 F (138 C)
Steam Pressure Limits	Maximum Inlet	35 psi (241 kPa)
	Differential	20 psi (138 kPa)
Flow Type		Equal%
Material	Body	Bronze
	Stem	Stainless Steel
	Seat	Bronze
	Plug	Brass
	Packing	Spring Loaded Teflon
	Disc	Composition
Valve Connections		Female, Union Sweat
		$^5/_8$ in. ID ($^1/_2$ in. Nominal Copper) Tube
Maximum Ambient Temperature		140 F (60 C)
Actuator	Voltage	24 Vac -15%, +10% 50/60 Hz
	Power	22 VA at 24 vac
	Connections	Wire Leads
Weight		6.0 lb (3057 g)

NOTE: Avoid condensation which can facilitate corrosion. With 40 F (4 C) water, the maximum allowable ambient dew point temperature is 68 F (20 C). Piping insulation must not stop drainage at actuator mounting nut. Do not use hydraulic actuators with fluid temperatures below 40 F (4 C).



*Includes $2^{1}/_{32}$-in. (52 mm) for linkage extension.

NOTES:
1. Allow 3 in. clearance above actuator for removal. Mount actuators above the valve body at 45-degrees from vertical. Refer to Fig. 32.
2. Dimensions are in inches.

Fig. 35 — Valve Dimensions

SET-UP, CONFIGURATION, AND OPERATION

The Unit Ventilator Comfort Control module (P/N 110500) is designed to be installed using the CCN Network Service Tool, or a CCN Building Management system such as Building Supervisor, ComfortVIEW™ or ComfortWORKS® software. The control provides several comprehensive screens for easy set-up and configuration of the control. See Tables 23-29. Two additional screens display the operation of the equipment.

Each unit is factory-configured for the control sequence ordered. Only set points, schedules, alarm limits, and user options need to be adjusted. Tables 23-29 depict the screens that provide a list of the information contained within each function, the expected range of values for each parameter, and the allowable force limits or configuration range. For specific information about Network Service Tool, Building Supervisor, ComfortVIEW, or ComfortWORKS software refer to the operating instructions for each specific piece of software.

The Service Configuration screens are used to specify the equipment model and control sequence being used, such as the type of heating or cooling used (chilled water, DX cooling, steam, or hot water) and the damper control type (ASHRAE Cycle I, II or III). These values are factory-configured for the control sequence as ordered. A separate configuration screen is used to modify the factory pre-configured alarm set points, if required, in order to meet a specific customer requirement.

The service configuration screens are located under the Diagnostic/Service Configuration function. See Table 24. Alarm configurations are shown in Table 25.

The Modify controller screen allows the installer to select from a list of standard control options which can be used for specific applications. Standard control options include Space Temperature Set Point adjustment with an adjustable maximum limit, the ability to provide dehumidification with or without reheat, override duration, unoccupied free cooling, or warm up temperature check, and other control features.

The control configuration screens are located under the CCN Configuration function. See Table 27.

The Set Point screen is used to configure the desired control set points for the specific application. These set points include the occupied heating and cooling set points, the unoccupied heating and cooling set points, the ventilation airflow set point, the IAQ set point (optional) and the ASHRAE Cycle III Damper set point (for Cycle III control). The Set Point screen is located under the Modify/Set Points function. See Table 28.

The Points/Display screen is used to monitor equipment operation and provides a simple overview including: the operating mode, heating and cooling capacity, ventilation airflow value, equipment and sensor alarms, and a list of actual sensor and output values. The Status Display screen is located under the Points/Display function. See Table 26.

The Maintenance screen provides an indication of the control algorithm operation and a view of each individual control loop as it is currently functioning. The Maintenance screens are located under the Diagnostic/Maintenance function. See Table 29. The Linkage Maintenance screens are located under the Diagnostic/Maintenance function. See Table 29. The Maintenance screen provides an indication of the information the Unit Ventilator Comfort Control module has received from the linkage thermostat (if supplied).

LEGEND (For Tables 23-29)

Act — Actual
AQ — Air Quality
ASCII — American Standard Code for Information Interchange
ASHRAE — American Society of Heating, Refrigeration and Air Conditioning Engineers
CCN — Carrier Comfort Network®
Cfg — Configured
Cntrl — Control
CV — Constant Volume
DI — Discrete Input
DX — Direct Expansion
Ele — Element
Hi Lim — High Limit
Hys — Hystersis
Kd — Derivative Constant
Ki — Integral Constant
Kp — Proportional Constant
Lo Lim — Low Limit
MAD — Mixed-Air Damper
MAT — Mixed Air Temperature Sensor
Med — Medium
min — minute
Norm — Normal
Nr — Number
OAT — Outdoor-Air Temperature Sensor
Oc/Occ — Occupied
PID — Proportional/Integral/Derivative
Pos — Position
RH — Relative Humidity
Schd — Schedule
SP/Setpt — Setpoint
Stg — Stage
Sup Blk # — Supervisory Block Number
Sup Bus — Supervisory Bus Number
Sup Ele — Supervisory Element Number
Temp/Tmp — Temperature
Tim Gard — Time Guard
Tmd Ovr — Timed Override
Tmd Ovr Hrs — Timed Override Hours
Unoc — Unoccupied

Table 23 — CCN Device Configuration

DEVICE NAME	DESCRIPTION	LOCATION	SOFTWARE PART NUMBER
40UV/UH	Comfort System Unit Ventilator		CESR-131191-02

NOTE: The device name, description, and location fields can be modified by the Building Supervisor or ComfortWORKS® software.

Table 24 — Service Configuration

DESCRIPTION	POINT NAME	STATUS / UNITS		RANGE	DEFAULT
2 Pipe Changeover	UNITTYPE	Disable/Enable		0 - 1*	Disable
ASHRAE Cycle Fan Control	CYCLE	x		1 - 3†	2
# Fan Speeds (1-3)	FAN_TYPE	x		1 - 3†	3
Unit Size	UNITSIZE	xxxx	CFM	100 - 5000	1000
% Air Flow Med	AFMED	*	%	30 - 100	80
% Air Flow Low	AFLOW	*	%	20 - 100	70
Fan PID					
Kp	KP	xx.x		0.0 - 40.0	10.0
Ki	KI	x.x		0.0 - 10.0	3.0
Kd	KD	xx.x		0.0 - 20.0	0.0
Starting Value	STARTVAL	xx.x	%	0.0 - 100.0	0.0
Cooling Type CV Cooling	COOL_TYP	x		0 - 3†	0
Kp	KP	xx.x		0.0 - 40.0	8.0
Ki	KI	x.x		0.0 - 10.0	0.3
Kd	KD	xx.x		0.0 - 20.0	0.0
Starting Value	STARTVAL	xx.x	°F	40.0 - 90.0	65.0
Staged Cooling Nr of Stages	STAGES	x		1 - 2	1
Stg 1 Tim Gard	TG1	Disable/Enable		0 - 1*	Enable
Stg 2 Tim Gard	TG2	Disable/Enable		0 - 1*	Enable
Stage 1 Logic Type	CLT1	Norm/Invert		0 - 1	Normal
Stage 2 Logic Type	CLT2	Norm/Invert		0 - 1*	Normal
Heating Type	HEAT_TYP	x		0 - 3†	0
Heating					
Kp	KP	xx.x		0.0 - 40.0	8.0
Ki	KI	x.x		0.0 - 10.0	0.3
Kd	KD	xx.x		0.0 - 20.0	0.0
Starting Value	STARTVAL	xx.x	°F	40.0 - 90.0	80.0
Fan Off Value	HCFOV	xx.x	°F	35.0 - 70.0	55.0
Staged Heating Nr of Stages	STAGES	x		1 - 2	1
Stg 1 Tim Gard	TG1	Disable/Enable		0 - 1*	Enable
Stg 2 Tim Gard	TG2	Disable/Enable		0 - 1*	Enable
Stage 1 Logic Type	HLT1	Norm/Invert		0 - 1*	Normal
Damper Type	MIXD	x		0 - 2	1
CV Mixed Air Damper					
Kp	KP	xx.x		0.0 - 40.0	8.0
Ki	KI	x.x		0.0 - 10.0	0.3
Kd	KD	xx.x		0.0 - 20.0	0.0
Starting Value	STARTVAL	xx.x	°F	40.0 - 90.0	60.0
Air Quality					
Kp	KP	xx.xx		0 - 1.0	0.1
Ki	KI	xx.xx		0 - 1.0	0.03
Max AQ Output	AQMDP	xxx.x	%	0.0 - 100.0	85.0
AQ Low Voltage	Volts	xx.x	Volts	0.0 - 10.0	2.0
AQ High Voltage	AQINHI	xx.x	Volts	0.0 - 10.0	10.0
AQ Low Reference (PPM)	AQLO	xxxx		0.0 - 5000.0	0.0
AQ High Reference (PPM)	AQHI	xxxx		0.0 - 5000.0	2000.0
Filter Timer hrs * 100	FIL_TIMR	xx		0 - 99	12
Space Temp Trim	RATTRIM	xx.x	^F	–5.0 - 5.0	0.0
MAT Sensor Trim	MATTRIM	xx.x	^F	–5.0 - 5.0	0.0
OAT Sensor Trim	OATTRIM	xx.x	^F	–5.0 - 5.0	0.0

*0 = Disable or Normal
1 = Enable or Inverted

†0 = None
1 = Modulating
2 = Two Position
3 = If applicable, Direct Expansion (DX) for Cooling Type. Electric Heating for Heating Type.

Table 25 — Alarm Service Configuration

DESCRIPTION	POINT NAME	STATUS / UNITS		RANGE	DEFAULT
Alarm Routing Control	ALRMCNT	xxxxxxxx		0 - 1*	11010000
Realarm Time	REALARM	xxx	min	1-255†	255
Cntrl Temp Hys		xx.x	^F		
Supply Air Temperature	SPTHYS			1.0 - 20.0	5.0
Lo Lim	LOWLIM	xxx.x	°F	–40.0 - 245.0	45.0
Hi Lim	HIGHLIM	xxx.x	°F	–40.0 - 245.0	150.0
Mixed Air Temperature					
Lo Lim	LOWLIM	xxx.x	°F	–40.0 - 245.0	40.0
Hi Lim	HIGHLIM	xxx.x	°F	–40.0 - 245.0	120.0
Relative Humidity					
Lo Lim	LOWLIM	xxx.x	%RH	0.0 - 100.0	30.0
Hi Lim	HIGHLIM	xxx.x	%RH	0.0 - 100.0	70.0
Outdoor Air CFM					
Lo Lim	LOWLIM	xxxx.x	CFM	0.0 - 5000.0	0.0
Hi Lim	HIGHLIM	xxxx.x	CFM	5000 - 5000	800.0
Air Quality					
Lo Lim	LOWLIM	xxxx.x		0.0 - 5000.0	0.0
Hi Lim	HIGHLIM	xxxx.x		0.0 - 5000.0	800.0
Outdoor Air Temperature					
Lo Lim	LOWLIM	xxx.x	°F	–40.0 - 245.0	40.0
Hi Lim	HIGHLIM	xxx.x	°F	–40.0 - 245.0	140.0

*0 = Disable
1 = Enable.
†255 disables realarming.

NOTE: Alarm retry time (in the event an alarm is not acknowledged) is fixed at 5 minutes.

Table 26 — Status Display

DESCRIPTION	POINT NAME	STATUS / UNITS		OVERRIDE LIMITS
Desired Mode	MODE	xxxxxx	ASCII*	
Equipment Status	ALARM	Norm/Alarm		
Controlling Temperature	SPT	xxx.x	°F	–40.0 - 245.0
Space Temperature	RAT	xxx.x	°F	–40.0 - 245.0
Supply Air Temperature	SAT	xxx.x	°F	–40.0 - 245.0
Mixed Air Temperature	MAT	xxx.x	°F	–40.0 - 245.0
Outdoor-Air Temperature	OATEMP	xxx.x	°F	–40.0 - 245.0
Fan Relay	SF	Off/On		0 - 1**
Fan Status	FANSTAT	xxxxxx	ASCII†	
Remote Start	REMOTE	Off/On		0 - 1**
Outdoor Air Enthalpy	ENT	High/Low		0 - 1**
Cooling Capacity	CCAP	xxx.x	%	
Heating Capacity	HCAP	xxx.x	%	
Outdoor Air cfm	OACFM	xxxx.x	CFM	0.0 - 5000.0
MAD Capacity 0.0 - 100.0	MIXDCAP	xxx.x	%	0.0 - 100.0
Filter Status	FLTSTAT	Clean/Dirty		0 - 1**
Air Quality (PPM)	AQ	xxxx.x		0.0 - 5000.0
Relative Humidity	RH	xxx.x	%RH	0.0 - 100.0
Fire Shutdown		Norm/Alarm		
FS		Fire shutdown		
Coil Freeze Detection	CFD	Norm/Alarm		0 - 1**
Changeover Switch Input	CHANGOVR	Heat/Cool		0 - 1**
Spare Discrete Input	DI0	Off/On		0 - 1**
Spare Analog Input	AI0	xx.x	Volts	0.0 - 10.0
Mixed Air Damper 1	MIXD1	Off/On		0 - 1**
Mixed Air Damper 2	MIXD2	Off/On		0 - 1**
Cooling 1	CCV1	Off/On		0 - 1**
Cooling 2	CCV2	Off/On		0 - 1**
Heating 1	HCV1	Off/On		0 - 1**
Heating 2	HCV2	Off/On		0 - 1**
Heating Enable Output	HEATING	Off/On		0 - 1**
Cooling Enable Output	COOLING	Off/On		0 - 1**

*The text used for Mode shall be one of the following:
Off, Occ Cool, Occ Heat, Fan Only, UnocCool, UnocHeat, Warm-Up, Free Cool.
†The text used for Fan Status shall be one of the following:
Off, Low, Medium, High.
**0 = Off, High, or Clean 1 = On, Low, or Dirty.

NOTE: The presence of override limits indicates that the point is forcible, all others are read only.

Table 27 — CCN Configuration

DESCRIPTION	POINT	STATUS / UNITS		RANGE	DEFAULT
Warm-Up Temp Check	WARMENAB	Disable/Enable		0 - 1*	Enable
Unoccupied Fan Cycling	FAN_CYCL	Disable/Enable		0 - 1*	Disable
Unoccupied Free Cooling	NTEN	Disable/Enable		0 - 1*	Enable
Free Cooling Lock-out	NTLO	xx.x	°F	35 - 80	50.0
DX Outdoor Air Lock-out	DXLO	xxx.x	°F	–40 - 65	60.0
Max Offset Adjustment	LIMT	xx.x	^F	0 - 20	0.0
Air Quality Control	AQEN	Disable/Enable		0 - 1*	Disable
High Humidity Limit	HIHUM	xxx.x	%RH	0 - 100	100.0
Local RH Sensor	RHSENS	No/Yes		0 - 1*	No
Reheat	REHEAT	Disable/Enable		0 - 1*	Disable
Occ Schd	OCCSCHED	xx		64 - 99†	64
Tmd Ovr Hrs	TIMOVRID	x	hours	0 - 4	0
Linkage Thermostat					
Cool Strt Bias (min/deg)	KCOOL	xx	xx	0 - 60	10
Heat Strt Bias (min/deg)	KHEAT	xx	min	0 - 60	10

*0 = Disable or No 1 = Enable or Yes
†Value below 65 (i.e., min value/default) disables global occupancy from CCN.

Table 28 — Set Point Configuration

DESCRIPTION	POINT	STATUS / UNITS		RANGE	DEFAULT
Setpoint					
Oc Heat SP	OHSP	xx.x	°F	40 - 90	70.0
Oc Cool SP	OCSP	xx.x	°F	45 - 99	75.0
Unoc Heat SP	UHSP	xx.x	°F	40 - 90	55.0
Unoc Cool SP	UCSP	xx.x	°F	45 - 99	90.0
Cycle III Damper Setpt	C3DSP	xx.x	°F	40 - 90	55.0
Economizer Lock-Out Temp	ELOSP	xx.x	°F	40 - 90	63.0
Ventilation Setpoint	OASP	xxxx.x	CFM	100 - 5000	200.0
AQ Setpoint (PPM)	AQSP	xxxx.x		0 - 5000	650.0

Table 29 — Maintenance

DESCRIPTION	POINT	STATUS / UNITS		OVERRIDE LIMITS
Occupied	OCCSTAT	No/Yes		
Linkage in Effect	DAVCL	No/Yes		
Tmd Ovr in Effect	TIMOV*	No/Yes		
Heat Master Reference	HCMR	xxx.x	°F	
Heat Submaster Reference	HCSR	xxx.x	°F	35.0 to 140.0
Cool Master Reference	CCMR	xxx.x	°F	
Cool Submaster Reference	CCSR	xxx.x	°F	40.0 to 150.0
MAD Master Reference	MIXDMR	xxx.x	°F	
MAD Submaster Reference	MIXDSR	xxx.x	°F	48.0 to 120.0
Cfg MAD Min Position	MIXDMDP	xxx.x	%	0.0 to 100.0
Act MAD Min Position	DMPRMIN	xxx.x	%	
Temperature Reset Value	RESET	xx.x	^F	
Cooling in Effect	COOLFLAG*	No/Yes		
Heating in Effect	HEATFLAG*	No/Yes		
Reheat in Effect	REHTFLAG*	No/Yes		
AQ Control in Effect	AQFLAG	No/Yes		
AQ Calc Damper Pos	MDPAQ*	xxx.x	%	
Fan Status DI	FANDI	Off/On		
Fan Speed Relay 1	FANSPD1	Off/On		0 - 1†
Fan Speed Relay 2	FANSPD2	Off/On		0 - 1†
Linkage Thermostat Linkage Status	LINKSTAT*	x		
Sup Ele	SUPE-ADR*	xxx		
Sup Bus	SUPE-BUS*	xxx		
Sup Blk #	BLOCKNUM*	x		
Avg Oc Heat SP	OCLOSTPT*	xx.x	°F	
Avg Oc Cool SP	OCHISTPT*	xx.x	°F	
Avg Unoc Heat SP	UNLOSTPT*	xx.x	°F	
Avg Unoc Cool SP	UNHISTPT*	xx.x	°F	
Avg Zone Tmp	AZT*	xx.x	°F	
Avg Oc Zone Tmp	AOZT*	xx.x	°F	
Oc Stat	OCCSTAT*	x		

†0 = Off 1 = On

NOTE: The presence of override limits indicates that the parameter is forcible;
all others are read only except those marked (*) which cannot be forced or read from CCN.

START-UP

Start-up procedures vary depending on time of year (summer or winter) and building characteristics (new building/old building, occupied/unoccupied, etc.).

Start-up in the cooling mode requires proper care to avoid condensation problems. Condensation forms on surfaces that are colder than the dew point of the surrounding air. If a unit is started and is piped with low-temperature chilled water in a hot, humid atmosphere, condensation will form on many parts of the unit. In order to avoid excessive condensation, higher temperature water should initially be used (approximately 65 to 70 F). Also, the building should be as completely closed as possible. Close the unit's outside-air dampers. Bathroom and kitchen exhaust fans should be off.

As the building temperature drops, the chilled water temperature can be gradually reduced until it reaches 50 F. At this point the outside-air damper can be opened to take in minimum outside air. When the chilled water temperature is reduced to its design point, the exhaust fans can be turned on.

SERVICE

⚠ WARNING

Lock out and tag all power supplies to equipment and controls prior to servicing unit. Follow all safety codes. Failure to do so could result in personal injury.

Preventing Excessive Condensation on Unit — Excessive condensation can be caused by running chilled water through a unit with the unit fan off. If fan cycling is used, a water flow control valve should be installed to shut off the water when the fan stops.

Other methods of control which avoid condensation problems are as follows:

1. If condensation is forming on the unit, verify the chilled water valve is closing off tightly. Dirt or debris may prevent the valve from closing completely.
2. Continuous fan operation with motorized chilled water valve controlled by a thermostat.
3. Continuous fan operation with thermostat control to switch fan from high to low speed (instead of off).

Check Drain — Check drain pan, drain line, and trap at start of each cooling season. A standard type pipe cleaner for $^3/_4$-in. ID pipe can be used to be sure pipe is clear of obstruction so that condensate is carried away. Check the drain line at filter cleaning time during the cooling season. Be sure that debris has not fallen into unit through supply air grille.

Fan Motor Bearings — Standard motors are permanent split capacitor, which are equipped with permanently sealed and lubricated bearings. No lubrication is required unless special motors have been supplied or unusual operating conditions exist.

Fan Shaft Ball Bearing — These mid and inboard bearings are permanently sealed and lubricated. No additional maintenance is required. The end bearings must be lubricated at the start of each cooling and heating season. Add 5 to 10 drops of SAE 20 or 30 non-detergent based oil to the bearing.

Clean Fan Wheel — For access to fan assembly, remove discharge grille (if supplied). If unit is connected to ductwork, remove front (40UV) or bottom (40UH) panel, separate fan shaft from motor at bushing, remove motor, and slide fan assembly from track. Use a stiff brush or vacuum to remove dirt and debris from scroll. Wipe all fan surfaces with a damp cloth. Reassemble as necessary.

Clean or Replace Air Filters — At the start of each cooling season and after each month of operation (more or less depending on operating conditions), replace throwaway filter or clean permanent filter.

THROWAWAY FILTER — Replace filter with a good quality filter of the correct size. Do not attempt to clean and reuse disposable filters. See Table 1 for filter sizes.

PERMANENT FILTER (Fiber Type)

1. Tap on solid surface to dislodge heavy particles.
2. Wash in hot water. If needed, use mild solution of commercial solvent such as sal soda or trisodium phosphate.
3. Set filter on end so that water drains out through slots in frame. Allow filter to dry thoroughly.
4. Recharge filter with recharging oil. Three ounces is sufficient for a medium size filter. Oil may be applied by insect spray gun. For easier spraying, the oil can be warmed.

   If the filter is dipped in the recharging oil, remove it immediately and allow to drain through slots in frame.
5. Replace filter in unit.

If another type of filter is used, follow the filter manufacturer's instructions.

ECM Motor Removal and Reinstallation (Fig. 36) — Carrier unit ventilators utilize an Electronically Commutated Motor (ECM) to drive the indoor fan.

The ECM is a factory programmed motor that is standard with factory-supplied controls (CCN) and units without factory-supplied controls that are used in high-static applications or high-capacity coils.

The ECM is programmed with an algorithm that maintains a constant torque as the static pressure on the system varies. For example, as the filter pressure drop increases due to dirt, the fan will increase speed (rpm) to maintain the cfm.

The ECM is identified by the two electrical receptacles located on the housing. See Fig. 8A, 8B, and 36.

The first receptacle is a 5-row in-line connector that feeds the motor line voltage. This may be either 115 volts or 230 volts. Units that are wired for 230 volts have a jumper between terminals 1 and 2 on this plug (see wiring diagram).

The second receptacle on the motor is a 16-pin connector and is used for speed switching. This is a low voltage (24-volt) connection. There is a jumper wire between terminals 1 and 3. This is a 24-volt ground. Voltage is present at all times when the motor is energized.

NOTE: A time delay exists between the time the motor speed is switched and the motor's reaction. This is designed into the electronics and **does not** indicate motor problems.

When replacing the motor, note the following:

- Check the part number of the old motor against that of the replacement. There is a tag indicating the eight-digit part number and begins with UVE. This is the program number used for this motor.
- The motor must be installed per the instructions below. It is important to maintain the dimension between the fan compartment bulkhead and the coupling.

IMPORTANT: If a replacement cooling shroud has been supplied, it should be installed and the old one discarded. The motor shroud directs cooling air across the motor to provide proper cooling. Never run the motor without the cooling shroud in place. Ensure the shroud inlet ring does not touch the motor; a gap of $^1/_{16}$ in. to $^1/_8$ in. is acceptable.

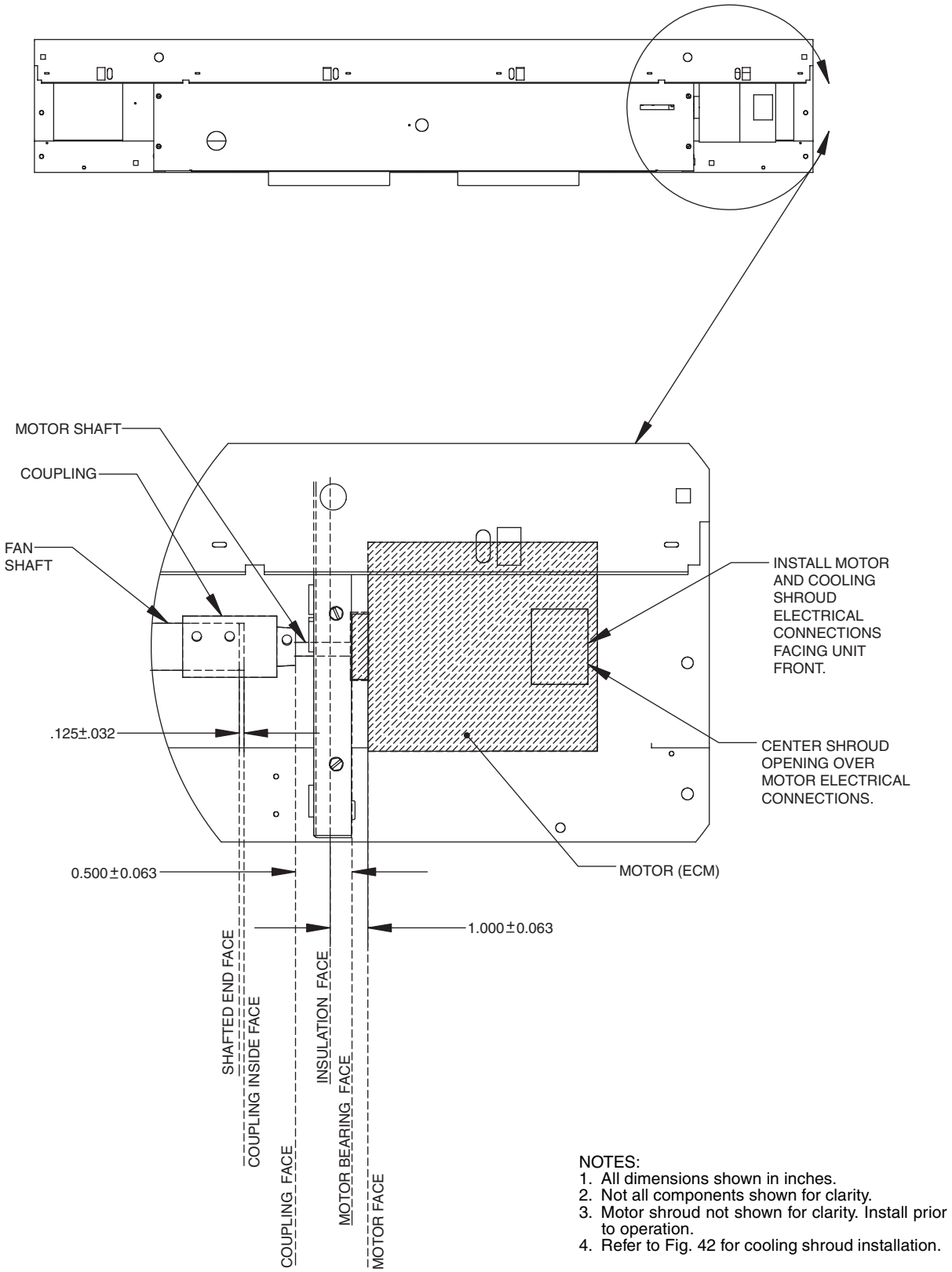


Fig. 36 — 40UV,UH Ventilator Blower Section Assembly — ECM Motor Detail

⚠ CAUTION

Ensure the unit is completely assembled when checking the fan speed. Replace all panels, including the filters, before checking the fan for operation. When the internal pressure drops at a normal condition, the loading on the motor will be such that the fan can come up to selected speed.

Failure to ensure unit is completely assembled may result in reduced life of unit and/or personal injury.

To remove and re-install the motors, proceed as follows; refer to Fig. 36:

1. Remove the wire plugs from the motor.
2. Remove the 2 screws holding the motor shroud to the bulkhead.
3. Slide the shroud off the motor to the right.
4. Loosen the 3 setscrews on the shaft coupling between the motor shaft and the fan shaft.
5. Loosen the motor 'belly band' and slide motor out of the 'belly band' to the right. It is unnecessary to remove the motor mounting bracket from the bulkhead. Loosen only the 'belly band' securing the motor in the mount.
6. Reinstall the motor in the 'belly band.'
7. Ensure the blower wheels are centered within the fan housings (between the inlet rings) before securing the motor shaft coupling.

⚠ CAUTION

The motor electronics will fail prematurely if no air is able to circulate over the motor.

8. Ensure the motor housing is at least 1 in. from the bulkhead so that air will be able to circulate over the motor.
9. For vertical type units, position the motor so that the motor wire plugs are front facing on a horizontal plane. For horizontal type units with ceiling mounts, position the motor so that the motor wire plugs are front facing on a vertical plane.
10. Secure the 3 setscrews on the shaft coupling when the motor is properly positioned and the blower wheels are centered within their housing.
11. Re-secure the motor 'belly band' around the motor.
12. Reinstall the motor shroud. It is important that the motor shroud be installed prior to operation of the motor. Ensure the venturi is installed on the motor shroud.
13. Re-secure the two screws holding the motor shroud to the bulkhead.
14. Reinstall the motor wire plugs.

Blower Assembly Section Removal and Reinstallation (Fig. 37)

⚠ WARNING

Lock out and tag all power supplies to equipment and controls prior to servicing unit. Follow all safety codes. Failure to do so could result in personal injury.

⚠ CAUTION

Be careful with all components during installation, especially the bearing and plastic blower wheels. Any extreme force applied to these components can cause unintended damage and could void the unit warranty.

To remove blower assembly:

1. Turn off power to the unit.

IMPORTANT: Tag each right front panel (40UV) or middle bottom panel (40UH) for each unit. Panels have electrical information specific to each unit.

2. Remove all front (40UV) or bottom (40UH) panels. Remove end panels.
3. Remove top panel with $^{5}/_{16}$ in. nut driver and set optional vanes and screens to the side (40UV). Remove ductwork if required and remove top (40UV) or front (40UH) discharge plenum.
4. Remove $^{1}/_{4}$ in. head screws along length of unit that secure coil baffle to blower section. See Item 5 in Fig. 37.
5. Remove four $^{1}/_{4}$ in. head screws that connect the blower section sides to the coil section sides. See Item 2 in Fig. 37.
6. Remove the $^{1}/_{4}$ in. head screw from the center of the blower deck that attaches the blower deck to the pipe chase. See Item 1 in Fig. 37.
7. Remove six $^{1}/_{4}$ in. head screws attaching coil baffle to coil section. See Item 4 in Fig. 37.
8. Remove the harness connector(s) from the motor.
9. Remove the $^{1}/_{4}$ in. head screw from the green ground wire that connects the motor to frame if unit has a PSC motor. ECM motors are grounded through the harness.
10. Remove the two carriage bolts retaining the front brace to the frame sides. See Item 6 in Fig. 37.
11. Remove the four nuts retaining the blower section to the back (40UV) or top (40UH) frame. See Item 3 in Fig. 37.
12. Remove the two $^{5}/_{16}$ in. nuts retaining the inboard bearing bracket to the pipe chase (40UV,UH150 units only). See Item 6 in Fig. 38.
13. Remove blower section from frame.

To reinstall blower assembly to frame of unit:

1. Reinstall blower section into frame assembly.
2. Tighten the four $^5/_{16}$ in. nuts retaining blower section to frame. See Item 3 in Fig. 37.
3. Tighten the two $^5/_{16}$ in. nuts retaining the inboard bearing bracket to the pipe chase (40UV,UH150 units only). See Item 6 in Fig. 38.
4. Reinstall two carriage bolts that attach the front brace to the frame sides. See Item 6 in Fig. 37.
5. Rotate the fan shaft by hand to ensure that fans are unrestricted and can rotate freely. Check for any fan obstructions.
6. Re-attach green ground wire that connects the motor to the frame with ¼ in. head screw if unit has a PSC motor. ECM motors are grounded through the harness.
7. Connect harness connector(s) to motor.
8. Reinstall the coil baffle using six $^1/_4$ in. head screws that attach the coil baffle to the coil section. See Item 4 in Fig. 37.
9. Reinstall the $^1/_4$ in. head screw at center of blower deck attaching blower deck to pipe chase. See Item 1 in Fig. 37.
10. Reinstall the four $^1/_4$ in. head screws holding the blower section sides to the coil section sides. See Item 2 in Fig. 37.
11. Reinstall $^1/_4$ in. head screws along length of the unit, securing coil baffle to the blower section. See Item 5 in Fig. 37.
12. Reinstall optional vanes and screens and install top panel (40UV). Reinstall top (40UV) or front (40UH) discharge plenum and ductwork, if required.
13. Reinstall front (40UV) or bottom (40UH) panels. Reinstall end panels. **Ensure that tag on each right front panel (40UV) or middle bottom panel (40UH) matches unit tag.**
14. Restore power to unit.

IMPORTANT: Disassembly order is not as important as reassembly. The assembly order of the bearing bracket installation is critical to having a well balanced and sound blower deck.

Coil Assembly Removal and Reinstallation (Fig. 39)

⚠ WARNING

Lock out and tag all power supplies to equipment and controls prior to servicing unit. Follow all safety codes. Failure to do so could result in personal injury.

⚠ CAUTION

Turn off all power supplies to equipment and controls. Failure to do so may cause personal injury or damage to the unit.

To remove coil assembly:

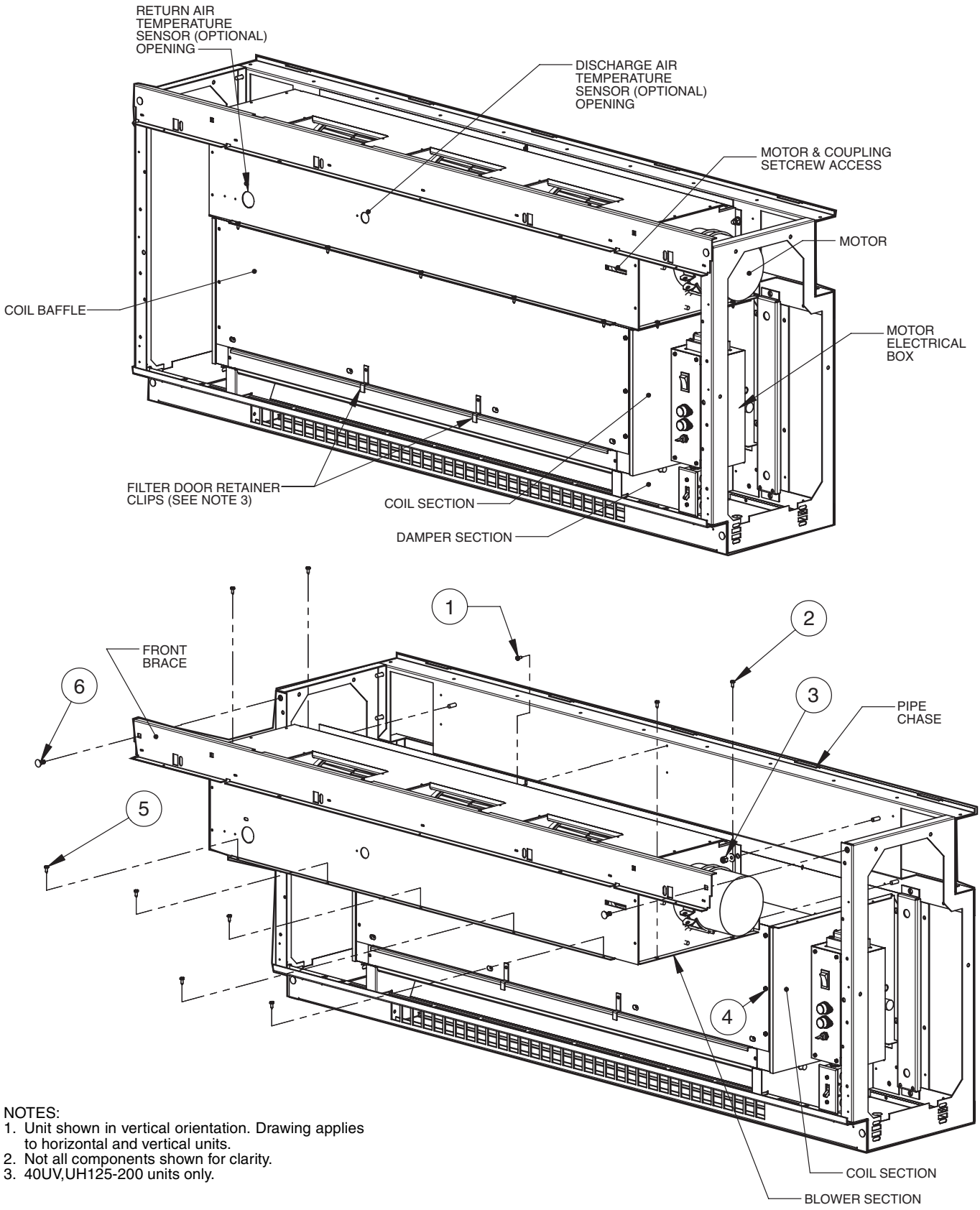
1. Turn off power to the unit.

IMPORTANT: Tag each right front panel (40UV) or middle bottom panel (40UH) for each unit. Panels have electrical information specific to each unit.

2. Remove all front (40UV) or bottom (40UH) panels. Remove end panels.
3. Remove $^1/_4$ in. head screws along length of unit that secure coil baffle to blower section. See Item 2 in Fig. 39.
4. Remove four $^1/_4$ in. head screws that connect the blower section sides to the coil section sides. See Item 1 in Fig. 39.
5. Remove $^1/_4$ in. head screws attaching outside air (OA) actuator to damper shaft OR locking quadrant assembly to damper shaft. Remove OA actuator or locking quadrant assembly.
6. Tag low-limit thermostat wiring and terminals. Disconnect low-limit thermostat wiring (right end compartment).
7. Drain water and/or recover refrigerant in accordance with all applicable codes. Disconnect piping from coil connections.
8. Tag optional electric heat element wire terminations for later reconnection. Disconnect element wires from electric heat control box (remove coil baffle for access).
9. Remove the four $^5/_{16}$ in. nuts retaining the coil section to the frame.
10. Remove coil section from frame.

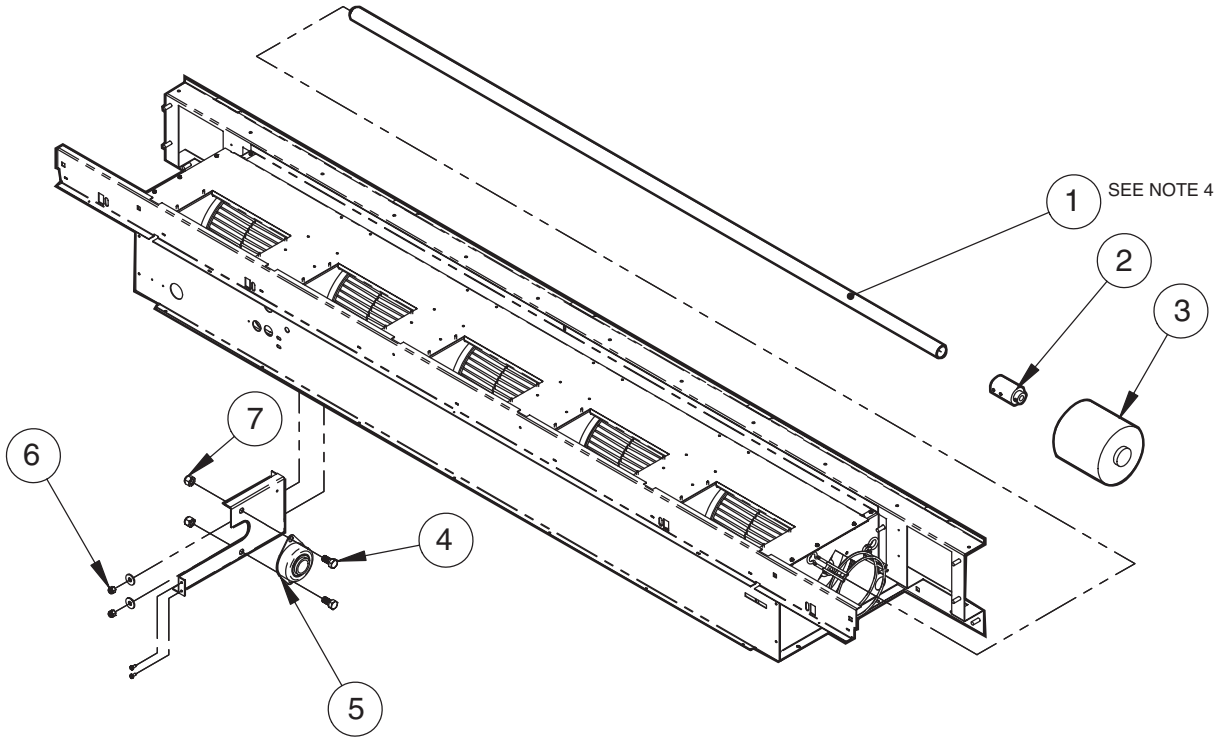
To reinstall coil assembly:

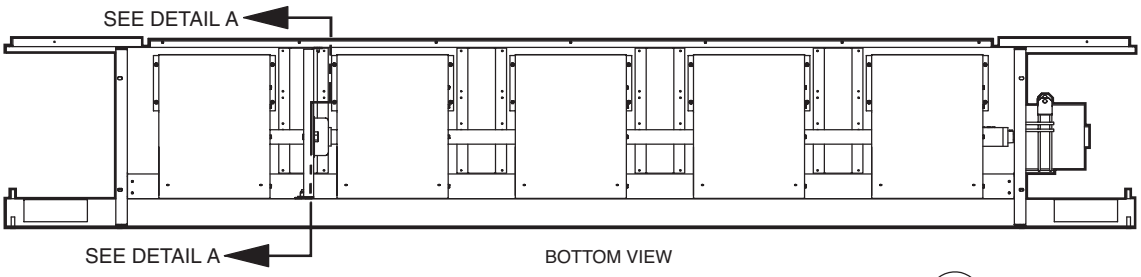
1. Replace coil section into frames assembly.
2. Tighten the four $^5/_{16}$ in. nuts retaining coil section to frame.
3. Reconnect electric heat wiring in electric heat control box.
4. Reconnect wiring to low limit thermostat.
5. Replace the four $^1/_4$ in. head screws holding the blower deck to coil section (two on each side).
6. Replace coil baffle using $^1/_4$ in. head screws. See Item 2 in Fig. 39.
7. Reinstall outside air actuator or locking quadrant handle using $^1/_4$ in. head screws.
8. Reconnect piping to coils. If water coil, purge air from coils and perform hydrostatic test to check for leaks. If DX coil, perform leak test using nitrogen, and evacuate and charge per recommended HVAC procedures and all applicable codes.
9. Replace coil section side insulation.
10. Replace front (40UV) or bottom (40UH) panels. Replace end panels. **Ensure that tag on each right front panel (40UV) or middle bottom panel (40UH) matches unit tag.**
11. Restore power to unit.

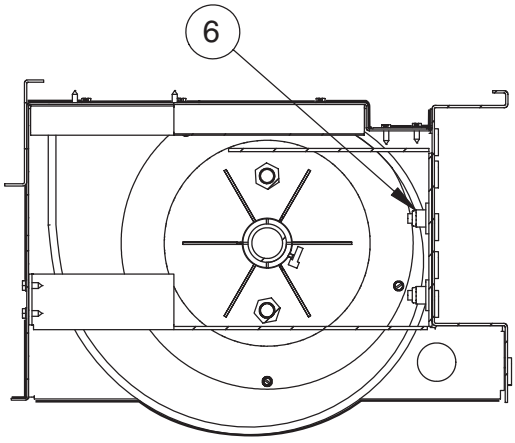


NOTES:
1. Unit shown in vertical orientation. Drawing applies to horizontal and vertical units.
2. Not all components shown for clarity.
3. 40UV,UH125-200 units only.

Fig. 37 — 40UV,UH Ventilator Blower Section

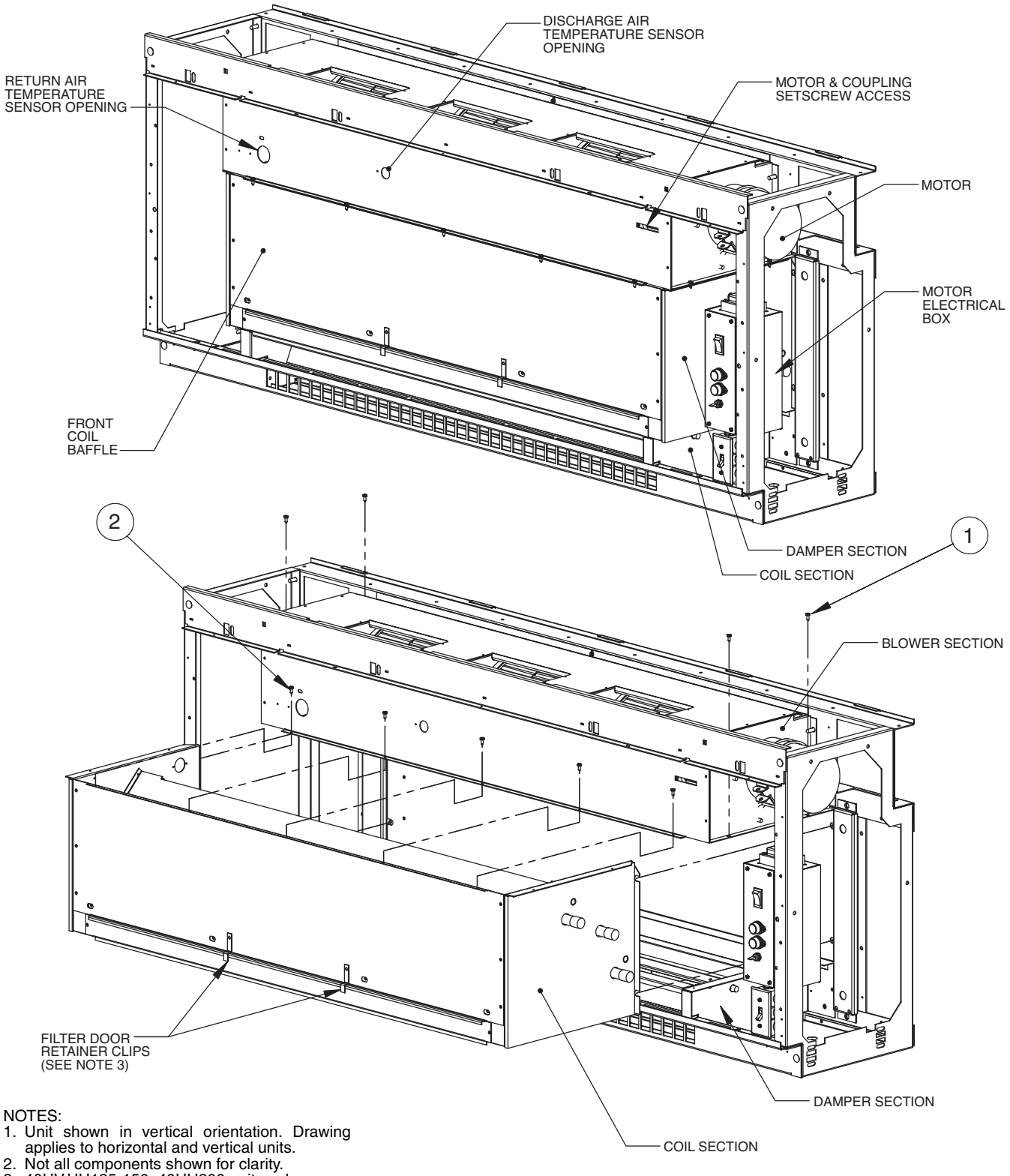






NOTES:
1. Not all components shown for clarity.
2. This drawing applies to 1500 cfm units only.
3. Remove shaft, motor, and coupling prior to bearing removal.
4. Refer to Fig. 36 and 43 for motor-coupling and coupling-shaft tolerances.

Fig. 38 — 40UV,UH Ventilator Inboard Bearing (40UV,UH150 Only)



NOTES:
1. Unit shown in vertical orientation. Drawing applies to horizontal and vertical units.
2. Not all components shown for clarity.
3. 40UV,UH125-150, 40UH200 units only.

Fig. 39 — 40UV,UH Ventilator Coil Section

Ball Bearing Replacement (40UV,UH150; 40UH200 Units Only) — Refer to Fig. 40 for 40UH200 units only, Fig. 41 for 40UV150 and 40UH150 units with PSC motors, Fig. 42 for 40UV150 and 40UH150 units with ECM motors.

⚠ WARNING

Lock out and tag all power supplies to equipment and controls prior to servicing unit. Follow all safety codes. Failure to do so could result in personal injury.

⚠ CAUTION

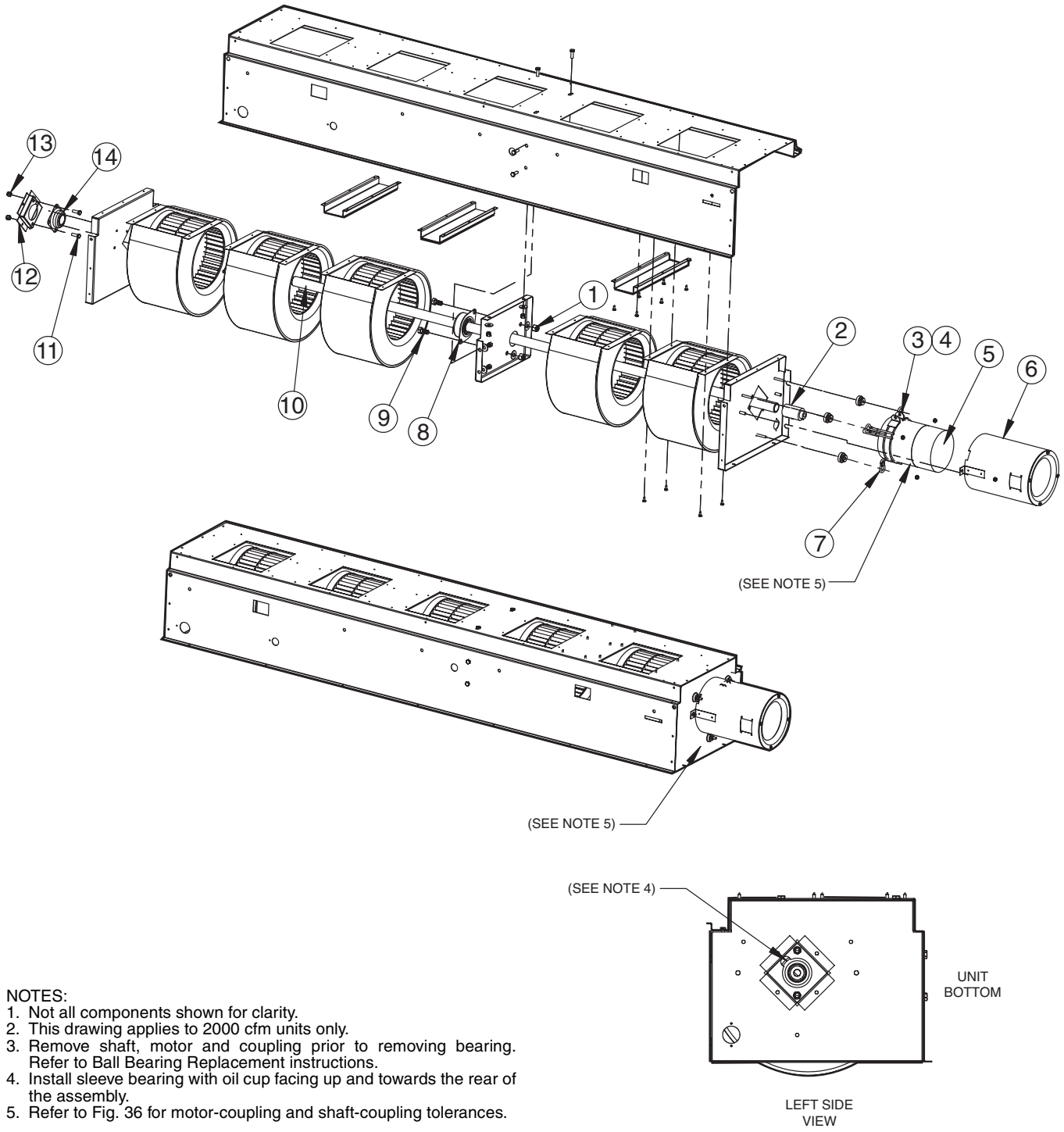
The assembly order of the bearing installation is critical. Be careful with all components during removal and installation. Any excessive force applied to these components can cause unintended damage and void unit warranty.

To replace ball bearing:

1. Turn off all power to unit.

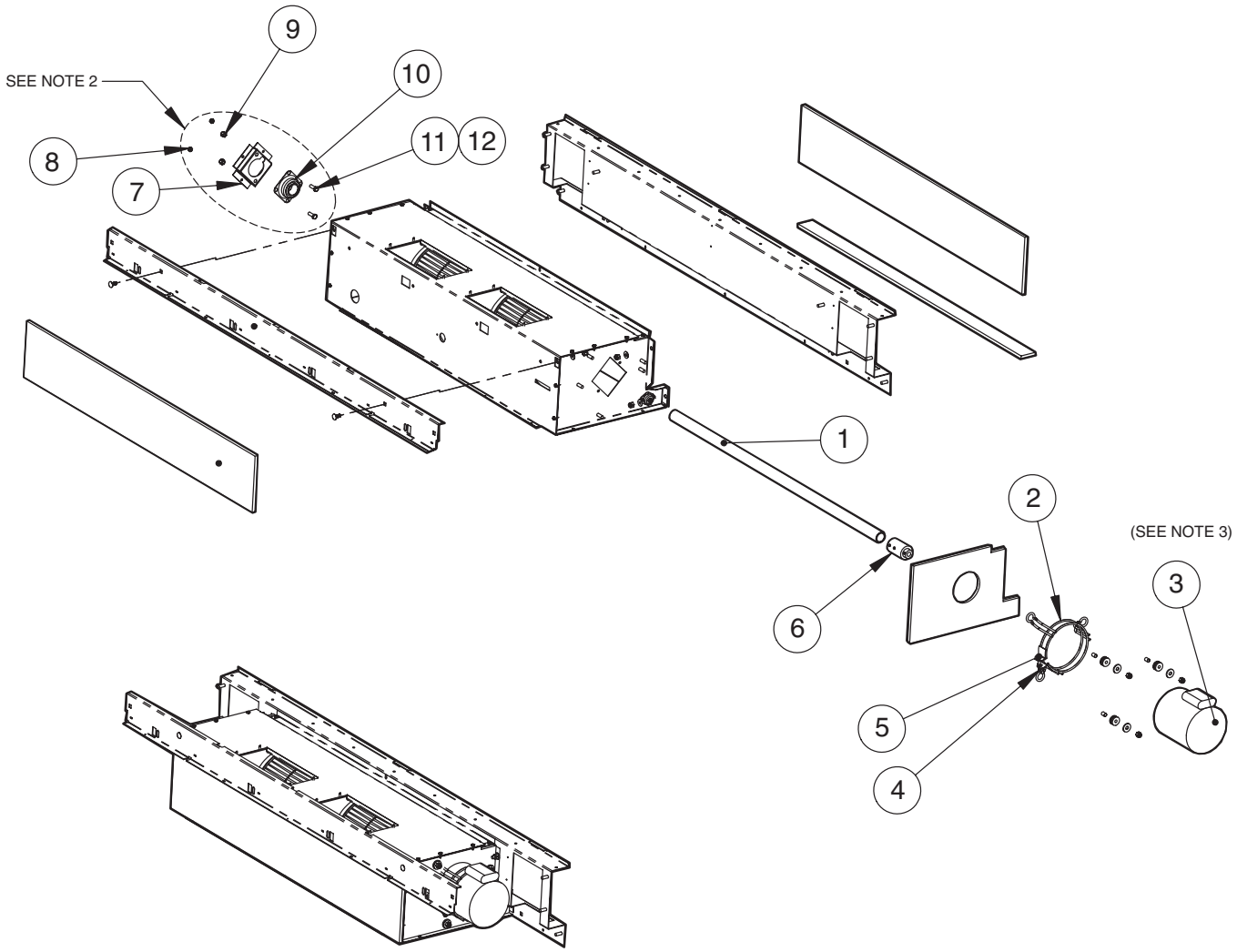
IMPORTANT: Tag each right front panel (40UV) or middle bottom panel (40UH) for each unit. Panels have electrical information specific to each unit.

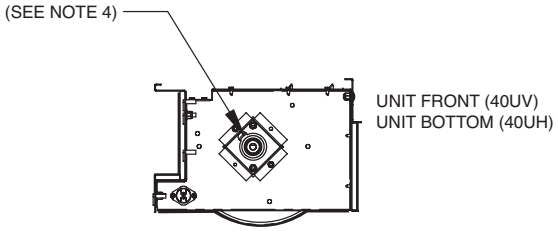
2. Remove front (40UV) or bottom (40UH) panels and right (motor end) end panel.
3. Remove top panel and set optional vanes and screens to the side (40UV). Remove ductwork if required and remove top (40UV) or front (40UH) discharge plenum. For non-ducted 40UH horizontal units with front double deflection discharge grille, remove grille for access to wheel setscrews. See Fig. 37.
4. Remove ¼ in. head screws along length of unit that secure coil baffle to blower section and remove front coil baffle. See Item 5 in Fig. 37.
5. Loosen setscrews on all blower wheels (two per wheel). See Fig. 38 and Fig. 40.
6. Loosen bearing setscrews.
7. Remove wiring harness connector(s) from motor.
8. If unit has ECM motor, remove motor shroud (sheet metal cover — Fig. 40, Item 6; Fig. 42, Item 4) by removing two $^{5}/_{16}$ in. hex nuts. **Do not discard cooling shroud.**
9. Loosen $^{5}/_{16}$ in. motor mount (Fig. 40, Item 7; Fig. 41, Item 2; Fig. 42, Item 2), nut (Fig. 40, Item 3; Fig. 41, Item 5; Fig. 42, Item 6), and bolt (Fig. 40, Item 4; Fig. 41, Item 4; Fig. 42, Item 5), until motor housing (Fig. 40, Item 5; Fig. 41, Item 3; Fig. 42, Item 3) moves freely.
10. Slide shaft-coupling-motor assembly (Fig. 38, Items 3, 2, 1; Fig. 40, Items 5, 2, 10) out of wheels and unit until shaft clears inboard/center bearing assembly (30 in. max clearance required from edge of frame end).
11. Remove $^{1}/_{2}$ in. bolts (Fig. 38, Item 4; Fig. 40, Item 9) and hex nuts (Fig. 38, Item 7; Fig. 40, Item 1) securing bearing to bearing bracket. Remove bearing (Fig. 38, Item 5; Fig. 40, Item 8).
12. Install new bearing (Fig. 38, Item 5; Fig. 40, Item 8). Secure with $^{1}/_{2}$ in. bolts (Fig. 38, Item 4; Fig. 40, Item 9) and hex nuts (Fig. 38, Item 7; Fig. 40, Item 1).
13. Slide shaft-coupling-motor assembly (Fig. 38, Items 3, 2, 1; Fig. 40, Items 5, 2, 10) back into bearing and wheels. **Do not use excessive force. Damage to wheels may occur.**
14. Insert shaft-coupling-motor assembly into wheels until motor clearance is as specified for motor type (PSC or ECM). See Fig. 43 or Fig. 36.
15. Ensure that motor shaft is perpendicular to motor blower endplate. Tighten $^{5}/_{16}$ in. motor mount (Fig. 40, Item 7; Fig. 41, Item 2; Fig. 42, Item 2), nut (Fig. 40, Item 3; Fig. 41, Item 5; Fig. 42, Item 6), and bolt (Fig. 40, Item 4; Fig. 41, Item 4; Fig. 42, Item 5), until motor (Fig. 40, Item 5; Fig. 41, Item 3; Fig. 42, Item 3) is secure.
16. Install motor shroud (sheet metal cover — Fig. 40, Item 6; Fig. 42, Item 4) using two $^{5}/_{16}$ in. hex nuts if using ECM motor. Align "window" with receptacles on motor. **Motor control module could overheat and fail if operated without cooling shroud**.
17. Re-attach green ground wire that connects the motor to the frame with $^{1}/_{4}$ in. head screw if unit has a PSC motor. ECM motors are grounded through the harness.
18. Re-attach wiring harness connector(s) to motor.
19. Center each wheel in its respective housing and tighten wheel setscrews (two for each wheel).
20. Rotate the fan shaft by hand to ensure that fans are unrestricted and can rotate freely. Check for any fan obstructions.
21. Remove lockout and operate unit for approximately 60 seconds to let inboard/center bearing mount self-adjust.
22. Lock out and tag all power supplies to equipment and controls. Tighten the two bearing setscrews.
23. Reinstall the coil baffle using the six $^{1}/_{4}$ in. head screws that attach the coil baffle to the coil section. See Item 5 in Fig. 37.
24. Reinstall $^{1}/_{4}$ in. head screws along length of unit securing coil baffle to the blower section. See Item 5 in Fig. 37.
25. Reinstall optional vanes and screens and install top panel (40UV). Reinstall top (40UV) or front (40UH) discharge plenum and ductwork if required or discharge grille.
26. Reinstall front (40UV) or bottom (40UH) panels. Reinstall end panels. **Ensure that tag on each right front panel (40UV) or middle bottom panel (40UH) matches unit tag.**
27. Restore power to unit.



NOTES:
1. Not all components shown for clarity.
2. This drawing applies to 2000 cfm units only.
3. Remove shaft, motor and coupling prior to removing bearing. Refer to Ball Bearing Replacement instructions.
4. Install sleeve bearing with oil cup facing up and towards the rear of the assembly.
5. Refer to Fig. 36 for motor-coupling and shaft-coupling tolerances.

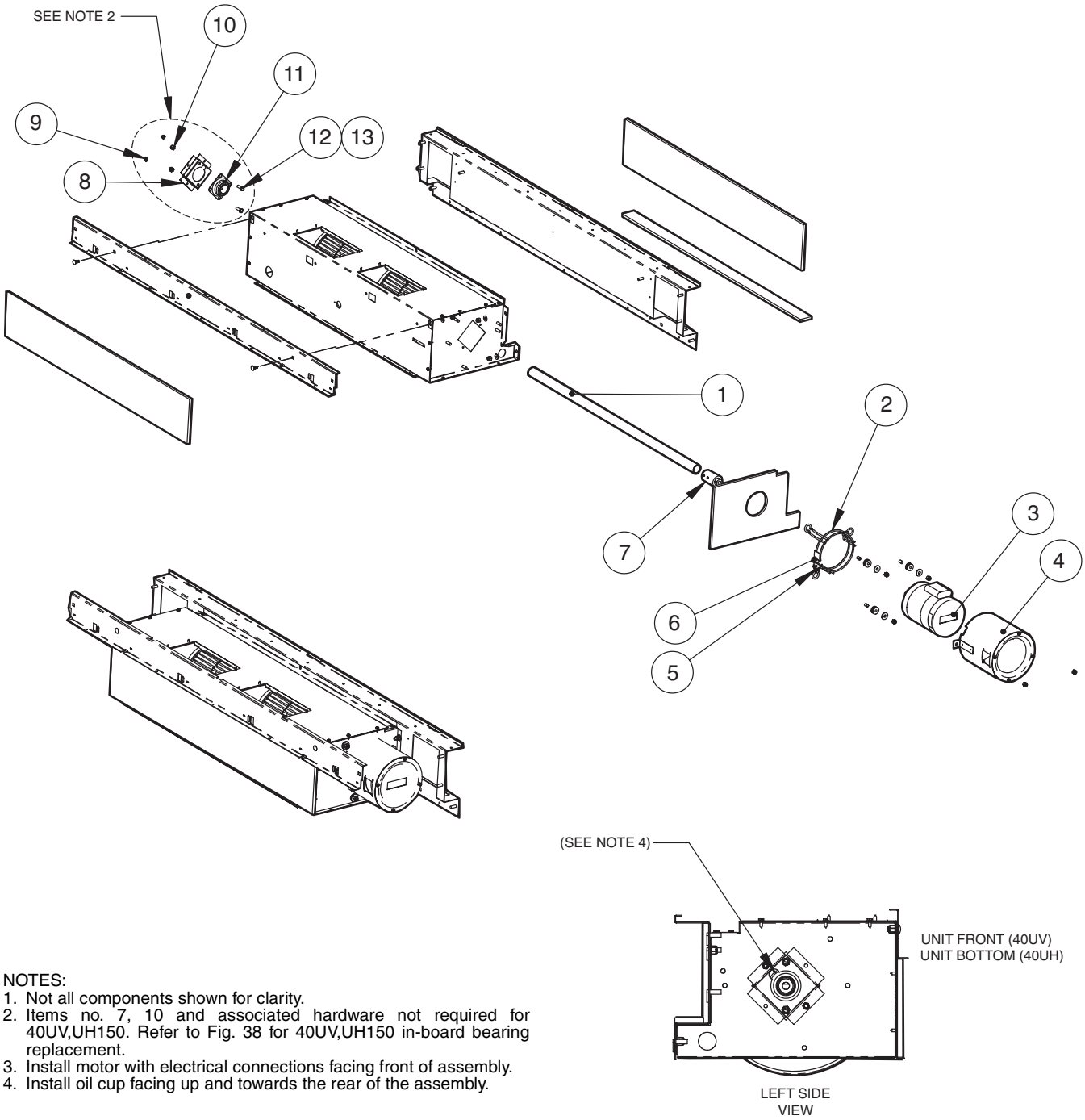
Fig. 40 — 40UH200 Ventilator Blower Drive Train Assembly





NOTES:
1. Not all components shown for clarity.
2. Items no. 7, 16 and associated hardware not required for 40UV,UH150. Refer to Fig. 38 for 40UV,UH150 in-board bearing replacement.
3. Install motor with capacitor facing up.
4. Install sleeve bearing with oil cup facing up and towards the rear of the assembly.

Fig. 41 — 40UV,UH Ventilator Blower Drive Train Assembly — 40UV050-150 and 40UH075-150 Units (PSC Motor)



NOTES:
1. Not all components shown for clarity.
2. Items no. 7, 10 and associated hardware not required for 40UV,UH150. Refer to Fig. 38 for 40UV,UH150 in-board bearing replacement.
3. Install motor with electrical connections facing front of assembly.
4. Install oil cup facing up and towards the rear of the assembly.

Fig. 42 — 40UV,UH Ventilator Blower Drive Train Assembly — 40UV050-150 and 40UH075-150 Units (ECM Motor)

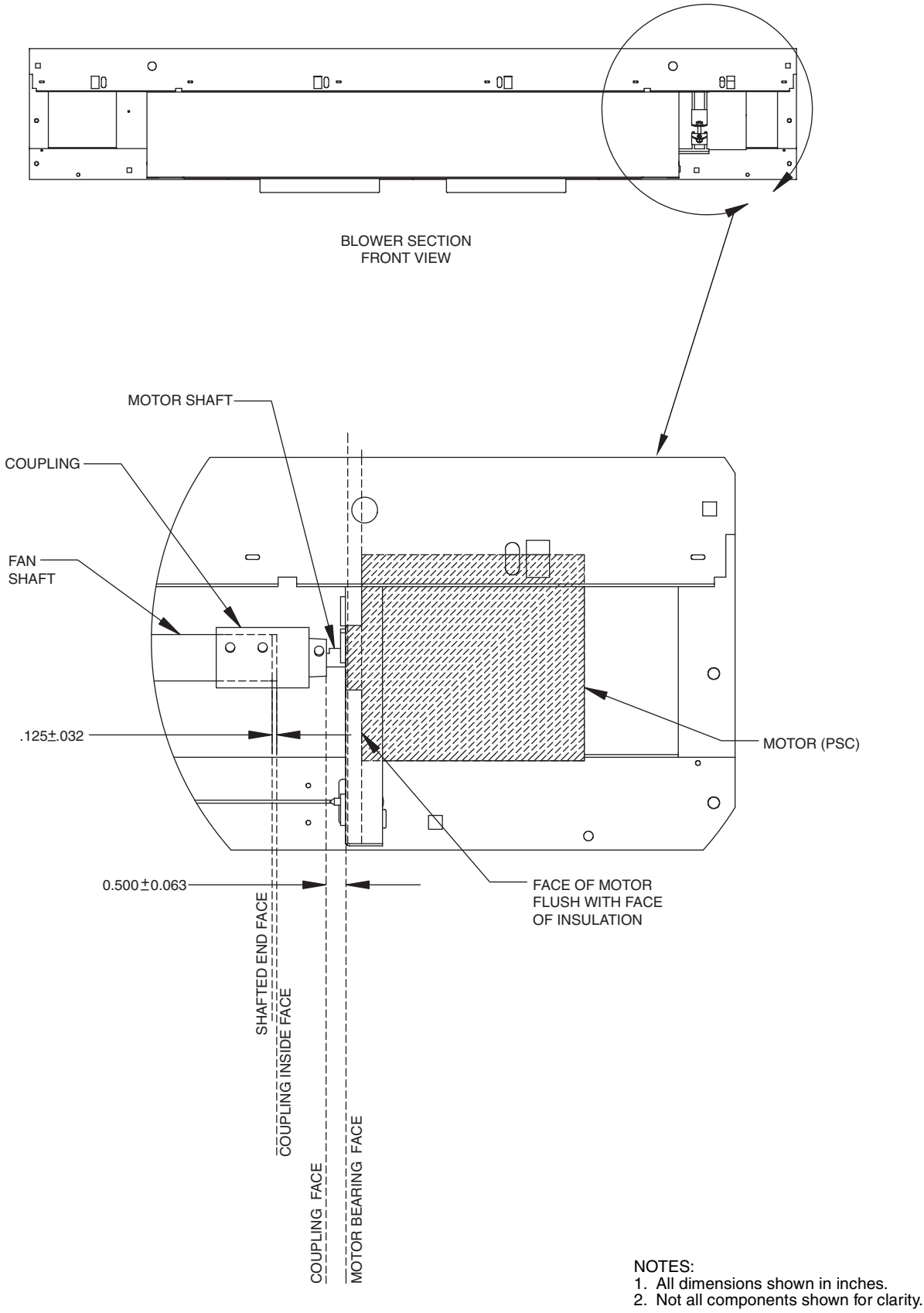


Fig. 43 — 40UV,UH Ventilator Blower Section Assembly — PSC Motor Detail

Blower Wheel Removal and Reinstallation (Fig. 44) — Refer to Fig. 40 for 40UH200 units only, Fig. 41 for 40UV050-150 and 40UH075-125 units with PSC motors, Fig. 42 for 40UV050-125 and 40UH075-150 units with ECM motors.

⚠ WARNING

Lock out and tag all power supplies to equipment and controls prior to servicing unit. Follow all safety codes. Failure to do so could result in personal injury.

⚠ CAUTION

The assembly order of the bearing installation is critical. Be careful with all components during removal and installation. Any excessive force applied to these components can cause unintended damage and void unit warranty.

To remove blower wheel:

1. Turn off all power to the unit.
2. Remove blower section per service instructions in Blower Assembly Removal and Reinstallation.

IMPORTANT: Tag each right front panel (40UV) or middle bottom panel (40UH) for each unit. Panels have electrical information specific to each unit.

3. Use $^5/_{32}$ in. hex tool to loosen setscrews on all blower wheels (two per wheel).
4. Loosen inboard/center bearing setscrews (only on 40UV,UH150 and 200 size units).
5. If unit has ECM motor, remove motor shroud (sheet metal cover — Fig. 40, Item 6; Fig. 42, Item 4) by removing two $^5/_{16}$ in. hex nuts. **Do not discard cooling shroud.**
6. Loosen $^5/_{16}$ in. motor mount (Fig. 40, Item 7; Fig. 41, Item 2; Fig. 42, Item 2), nut (Fig. 40, Item 3; Fig. 41, Item 5; Fig. 42, Item 6), and bolt (Fig. 40, Item 4; Fig. 41, Item 4; Fig. 42, Item 5), until motor housing (Fig. 40, Item 5; Fig. 41, Item 3; Fig. 42, Item 3) moves freely.
7. Slide shaft-coupling-motor assembly (Fig. 38, Items 3, 2, 1; Fig. 40, Items 5, 2, 10) out of wheels and unit until shaft clears inboard/center bearing assembly (30 in. maximum clearance required from edge of frame end).
8. Remove four $^1/_4$ in. head screw (Fig. 44, Item 6) securing blower housing(s) (Fig. 44, Item 7) to blower deck (Fig. 44, Item 3) and remove blower and wheel assembly.
9. Remove five $^1/_4$ in. head screws (Fig. 44, Item 5) securing blower inlet ring (Fig. 44, Item 4) to blower housing and remove inlet ring.
10. Remove blower wheel(s) (Fig. 44, Item 8).

To reinstall blower wheel:

1. Install new blower wheel(s) (Fig. 44, Item 8). Ensure that the fan blades are installed in the correct orientation (cup of blade towards discharge).
2. Install inlet ring (Fig. 44, Item 4) and install five ¼ in. head screws (Fig. 44, Item 5) securing blower inlet ring to blower housing (Fig. 44, Item 7).
3. Install four $^1/_4$ in. head screws (Fig. 44, Item 6) securing blower housing(s) (Fig. 44, Item 7) to blower deck (Fig. 44, Item 3).
4. Slide shaft-coupling-motor assembly (Fig. 38, Items 3, 2, 1; Fig. 40, Items 5, 2, 10) back into bearing and wheels. **Do not use excessive force. Damage to wheels may occur.**
5. Insert shaft-coupling-motor assembly into wheels until motor clearance is as specified for motor type (PSC or ECM). See Fig. 43 or Fig. 36.
6. Ensure that motor shaft is perpendicular to motor blower endplate. Tighten $^5/_{16}$ in. motor mount (Fig. 40, Item 7; Fig. 41, Item 2; Fig. 42, Item 2), nut (Fig. 40, Item 3; Fig. 41, Item 5; Fig. 42, Item 6), and bolt (Fig. 40, Item 4; Fig. 41, Item 4; Fig. 42, Item 5), until motor (Fig. 40, Item 5; Fig. 41, Item 3; Fig. 42, Item 3) is secure.
7. Install motor shroud (sheet metal cover — Fig. 40, Item 6; Fig. 41; Fig. 42, Item 4) using two $^5/_{16}$ in. hex nuts if using ECM motor. Align "window" with receptacles on motor. **Motor control module could overheat and fail if operated without cooling shroud.**
8. Reinstall blower section into frame assembly. See Fig. 37.
9. Tighten the four $^5/_{16}$ in. nuts retaining blower section to frame.
10. Tighten the two $^5/_{16}$ in. (Fig. 38, Item 6) nuts retaining the inboard bearing bracket to the pipe chase (only on 40UV,UH150 and 200 size units).
11. Reinstall two carriage bolts (Fig. 37, Item 6) that attach the front brace to the frame sides.
12. Re-attach green ground wire that connects the motor to the frame with $^1/_4$ in. head screw if unit has a PSC motor. ECM motors are grounded through the harness.
13. Re-attach wiring harness connector(s) to motor.
14. Center each wheel in its respective housing and tighten wheel setscrews (two for each wheel).
15. Reinstall one $^1/_4$ in. head screw (Fig. 37, Item 1) at center of blower deck attaching blower deck to pipe chase.
16. Reinstall the four $^1/_4$ in. head screws (Fig. 37, Item 2) holding the blower section sides to the coil section sides.
17. Rotate the fan shaft by hand to ensure that fans are unrestricted and can rotate freely. Check for any fan obstructions.
18. Remove lockout and operate unit for approximately 60 seconds to let inboard/center bearing mount self-adjust (only on 40UV,UH150 and 200 size units).
19. Lock out and tag all power supplies to equipment and controls. Tighten the two bearing setscrews (only on 40UV,UH150 and 200 size units). See Fig. 38, 40 or 44.
20. Reinstall the coil baffle using the six $^1/_4$ in. head screws that attach the coil baffle to the coil section. See Item 4 in Fig. 37.
21. Reinstall $^1/_4$ in. head screws along length of unit securing coil baffle to the blower section. See Item 5 in Fig. 37.
22. Reinstall optional vanes and screens and install top panel (40UV). Reinstall top (40UV) or front (40UH) discharge plenum and ductwork if required or discharge grille.
23. Reinstall front (40UV) or bottom (40UH) panels. Reinstall end panels. **Ensure that tag on each right front panel (40UV) or middle bottom panel (40UH) matches unit tag.**
24. Restore power to unit.

Sleeve Bearing Replacement (40UV050-125, 40UH075-125 and 40UH200 Units Only) (Fig. 44) — Refer to Fig. 40 for 40UH200 units only, Fig. 41 for 40UV050-150 and 40UH075-125 units with PSC motors, Fig. 42 for 40UV050-125 and 40UH075-150 units with ECM motors.

⚠ WARNING

Lock out and tag all power supplies to equipment and controls prior to servicing unit. Follow all safety codes. Failure to do so could result in personal injury.

⚠ CAUTION

The assembly order of the bearing installation is critical. Be careful with all components during removal and installation. Any excessive force applied to these components can cause unintended damage and void unit warranty.

To replace ball bearing:

1. Turn off all power to unit.

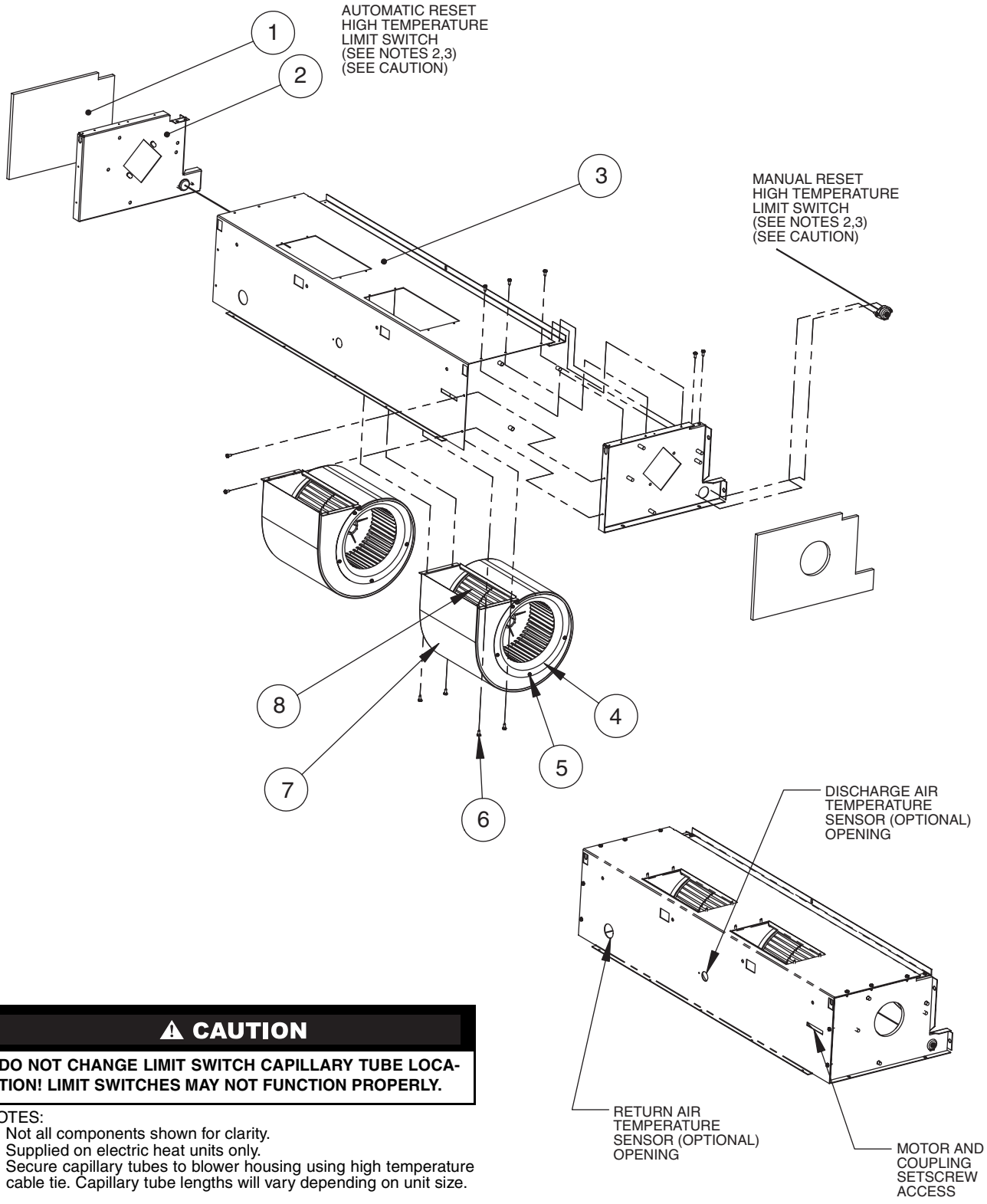
IMPORTANT: Tag each right front panel (40UV) or middle bottom panel (40UH) for each unit. Panels have electrical information specific to each unit.

2. Use $^{5}/_{32}$ in. hex (Allen) tool or $^{3}/_{8}$ in. nut driver to remove front (40UV) or bottom (40UH) panels and right (motor end) end panel.
3. Remove $^{1}/_{4}$ in. head screws (Item 5 in Fig. 37) along length of unit that secure coil baffle to blower section and remove front coil baffle.
4. Remove left blower section end (Item 2 in Fig. 44) insulation (Item 1 in Fig. 44).
5. Use $^{7}/_{16}$ in. socket to remove hex nuts (Fig. 40, Item 13; Fig. 41, Item 8; Fig. 42, Item 9) securing end bearing bracket (Fig. 40, Item 12; Fig. 41, Item 7; Fig. 42, Item 8) to blower section end.
6. Remove bearing bracket assembly (Fig. 40, Items 12, 14, 13, 11; Fig. 41, Items 7, 10, 9, 11; Fig. 42, Items 8, 11, 10, 12) from blower section end. Use care to slide assembly off of shaft end. **Hold shaft from inside blower section to prevent wheel damage.**
7. Use $^{1}/_{2}$ in. socket and $^{1}/_{2}$ in. combination wrench to remove hex nuts (Fig. 40, Item 13; Fig. 41, Item 9; Fig. 42, Item 10) and bolts (Fig. 40, Item 11; Fig. 41, Item 11; Fig. 42, Item 12) holding bearing (Fig. 40, Item 14; Fig. 41, Item 10; Fig. 42, Item 11) and bearing bracket (Fig. 40, Item 12; Fig. 41, Item 7; Fig. 42, Item 8) together.

⚠ CAUTION

Ensure sleeve bearing is installed with oil cup facing upwards as shown in left side view.

8. Replace bearing (Fig. 40, Item 14; Fig. 41, Item 10; Fig. 42, Item 11). Attach to bearing bracket using hex nuts and bolts. Align oil cup port with matching cutout in bearing bracket.
9. Use $^{7}/_{16}$ in. socket to slide replacement bearing (Fig. 40, Item 14; Fig. 41, Item 10; Fig. 42, Item 11) on to the end of shaft and install bearing bracket assembly (Fig. 40, Items 12, 14, 13, 11; Fig. 41, Items 7, 10, 9, 11; Fig. 42, Items 8, 11, 10, 12) in blower section end. Attach using hex nuts.
10. Add 5 to 10 drops of SAE 20 or 30 non-detergent based oil to bearing.
11. Rotate the fan shaft by hand to ensure that fans are unrestricted and can rotate freely. Check for any fan obstructions.
12. Reinstall left blower section end insulation (Item 1 in Fig. 44).
13. Reinstall $^{1}/_{4}$ in. head screws (Item 5 in Fig. 37) along length of unit securing coil baffle to the blower section.
14. Reinstall front (40UV) or bottom (40UH) panels. Reinstall end panels. **Ensure that tag on each right front panel (40UV) or middle bottom panel (40UH) matches unit tag.**
15. Restore power to unit.



⚠ CAUTION

DO NOT CHANGE LIMIT SWITCH CAPILLARY TUBE LOCATION! LIMIT SWITCHES MAY NOT FUNCTION PROPERLY.

NOTES:
1. Not all components shown for clarity.
2. Supplied on electric heat units only.
3. Secure capillary tubes to blower housing using high temperature cable tie. Capillary tube lengths will vary depending on unit size.

Fig. 44 — 40UV,UH Ventilator Blower Section Assembly Sheet Metal (All Units)

Damper Section Removal and Reinstallation (Fig. 45)

⚠ WARNING

Lock out and tag all power supplies to equipment and controls prior to servicing unit. Follow all safety codes. Failure to do so could result in personal injury.

⚠ CAUTION

The assembly order of the bearing installation is critical. Be careful with all components during removal and installation. Any excessive force applied to these components can cause unintended damage and void unit warranty.

To remove damper section:

1. Turn off all power to unit.

IMPORTANT: Tag each right front panel (40UV) or middle bottom panel (40UH) for each unit. Panels have electrical information specific to each unit.

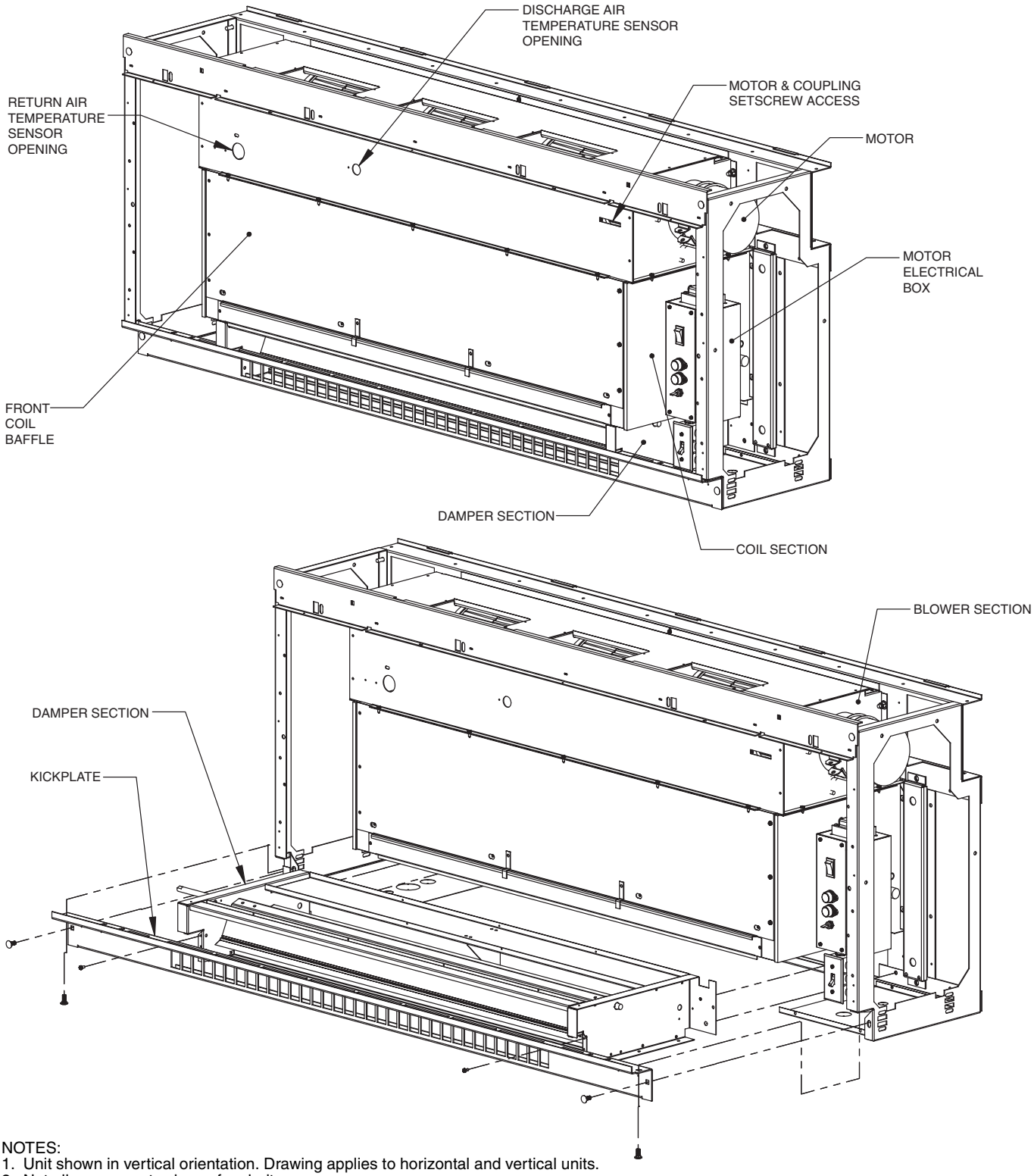
2. Use $^5/_{32}$ in. hex (Allen) tool or $^3/_8$ in. nut driver to remove front (40UV) or bottom (40UH) panels and right end panels.
3. Remove four carriage bolts and nuts securing kickplate to end frames.

IMPORTANT: Tag kickplate for each unit. Kickplate has electrical information specific to each unit.

4. Remove the two $^1/_4$ in. head screws securing kickplate to the damper sides (one on each side) and remove kickplate.
5. Remove $^1/_4$ in. head screws attaching outside air (OA) actuator to damper shaft or attaching locking quadrant assembly to damper shaft. Remove OA actuator or locking quadrant assembly.
6. Remove six $^1/_4$ in. head screws (3 per side) securing damper to 40UH unit rear panel.
7. Remove two $^5/_{16}$ in. nuts attaching damper assembly to back frame.
8. Remove damper assembly from unit.

To replace damper section:

1. Replace damper assembly into unit.
2. Replace $^5/_{16}$ in. nuts attaching damper assembly to back frame.
3. Replace six $^1/_4$ in. head screws (3 per side) securing damper to 40UH unit rear panel.
4. Replace $^1/_4$ in. head screws attaching OA actuator to damper shaft OR attaching locking quadrant assembly to damper shaft. Replace OA actuator or locking quadrant assembly.
5. Replace the two $^1/_4$ in. head screws securing kickplate to the damper sides (one on each side) and remove kickplate.
6. Replace four carriage bolts and nuts securing kickplate to end frames.
7. Reinstall front (40UV) or bottom (40UH) panels. Reinstall end panels. **Ensure that tag on each right front panel (40UV) or middle bottom panel (40UH) matches unit tag.**
8. Restore power to the unit.



NOTES:
1. Unit shown in vertical orientation. Drawing applies to horizontal and vertical units.
2. Not all components shown for clarity.

Fig. 45 — 40UV,UH Ventilator Damper Section Removal/Installation

TESTING

The Unit Ventilator Comfort Control module is designed for easy checkout and commissioning using the Carrier Comfort Network® (CCN) Service Tool. An RJ14 service connector jack is provided on each control board, which eliminates the need to modify any communication wiring when service is required. See Fig. 26.

Before any testing is performed, be sure all configuration has been completed and the device address and bus number have been changed from the factory defaults.

NOTE: No two devices should use the same address even if they are not connected to the CCN system. The Comfort Controller uses this unique addressing to provide a restart delay upon returning from a power failure and a start delay during normal operation. This prevents excessive demand by staggering the start time for each piece of equipment using a Unit Ventilator Comfort Controller.

To test the Comfort Controller, perform the following procedure:

1. The controller database must be uploaded into the Network Service Tool which will be used to perform the testing. This will allow access to all the necessary configuration and status information. Follow the operating instructions provided with the service tool and perform the controller upload.
2. With the control switch in the CONT position, apply power to the control. Verify the red LED on the control board flashes ON and OFF at a 1-second rate. It may take up to 5 seconds for this to occur initially as the control board is performing a self-health diagnostic check. Verify the fan starts to operate.
3. Using the Network Service Tool, select the controller to be tested from the menu provided, then select the DISPLAY function.
4. Using a digital thermometer to initially check and verify the temperature sensor, check the temperature values for the space/return air sensor, the supply air sensor, and the mixed air and outdoor-air sensors if installed. If an error exists between the actual value and the displayed reading, determine the difference between the two values, and enter a set point Trim (see Table 24) in the configuration table for the appropriate sensor. No correction is required for the supply air sensor. If this sensor has more than a ± 5 degree F error, replace the sensor.
5. Next, test the controller inputs and outputs as applicable. Verify that all modulating outputs are driven fully closed after power has been applied to the controller for at least 3 minutes. Verify that each water valve and the outdoor-air damper are fully closed. Use the procedures below to test the inputs and outputs as applicable to each control.

NOTE: The control drives all modulating outputs, which have been configured, closed when first returning from a power failure restart, regardless of whether an output is normally open, normally closed, or non-spring return type.

Water Valve Tests

⚠ CAUTION

The manual positioning lever on all water valves should only be used when controller power is OFF. DO NOT attempt to move this lever when controller power is applied. If the position lever does not move freely for manual positioning when the power is off, remove the valve cover and push the solenoid plunger down using a small screwdriver inserted in the slot below the solenoid.

MODULATING COOLING CONTROL — If a modulating chilled type water valve is used, verify that valve position is fully closed while the unit is unoccupied and the fan is OFF. Using the Network Service Tool, page down to the bottom of the Points Display screen and select the COOLING 2 output. Force the output to OFF. Next, select the COOLING 1 output and force this output ON. Verify the chilled water valve begins to open. Allow the valve to fully open and check to ensure the valve reaches its full stroke and does not stick or bind. After the valve has stopped opening, select the COOLING 2 output and force it to ON. The force placed earlier on the COOLING 1 output should be removed automatically and the chilled water valve should begin to close. After the valve has fully closed, remove any forces from the COOLING 1 and COOLING 2 outputs.

HEATING VALVES — If a modulating hot water or steam type heating valve is used, verify the position of the valve is fully closed while the unit is unoccupied and the fan is OFF. Using the Network Service Tool, page down to the bottom of the Points Display screen and select the HEATING 2 output. Force the output to OFF. Next, select the HEATING 1 output and force this output ON. Verify the heating valve begins to open. Allow the valve to fully open and check to ensure the valve reaches its full stroke and does not stick or bind. After the valve has stopped opening, select the HEATING 2 output and force it to ON. The force placed earlier on the HEATING 1 output should be removed automatically and the heating valve should begin to close. After the valve has fully closed, remove any forces from the HEATING 1 and HEATING 2 outputs.

Face and Bypass Damper Tests

COOLING CONTROL — For units equipped with cooling, verify that the face and bypass damper is in the full coil bypass position when the unit is unoccupied and the fan is off. Verify that the switch position indicator on the face and bypass damper actuator is pointing to the zero (0) position at this time. Verify the cooling valve is closed.

Using the Network Service Tool, page down to the bottom of the Status display screen and select the Heating Enable Output point. Force this output to OFF. Next, select the Cooling Enable Output and force this point to ON. Select the COOLING 2 output and force this point to OFF. Select the COOLING 1 output and force this point to ON. Verify the face and bypass damper begins to move toward the coil face position and the cooling valve opens. Check to ensure the valve reaches the full open position and the damper moves to the coil face position without sticking or binding. After the damper reaches the full coil face position, select the COOLING 2 output and force it to ON. The force placed earlier on the COOLING 1 output should be removed automatically, and the damper should begin moving toward the bypass position. After the face and bypass damper is in the bypass position, force the Cooling Enable Output to OFF. Verify the cooling valve is closed or closing. After the valve has fully closed, remove any forces from the COOLING 2, Heating Enable, or Cooling Enable Outputs.

HEATING CONTROL — For units equipped with heating, verify that the face and bypass damper is in the full coil bypass position when the unit is unoccupied and the fan is off. Verify that the switch position indicator on the face and bypass damper actuator is pointing to the zero (0) position at this time. Verify the heating valve is closed.

Using the Network Service tool, page down to the bottom of the Points display screen and select the Cooling Enable Output point. Force this output to OFF. Next, select the Heating Enable Output and force this point to ON. Select the HEATING 2 output and force this point to OFF. Select the HEATING 1 output and force this point to ON. Verify the face and bypass damper begins to move toward the coil face position and the heating valve opens. Check to ensure the valve reaches the full open position and the damper moves to the coil face position without

sticking or binding. After the damper reaches the full coil face position, select the HEATING 2 output and force it to ON. The force placed earlier on the HEATING 1 output should be removed automatically, and the damper should begin moving toward the bypass position. After the face and bypass damper is in the bypass position, verify the heating valve is closing. After the valve has fully closed, remove any forces from the HEATING 2, Heating Enable, or Cooling Enable Outputs.

Dampers

MODULATING OUTDOOR (OA) AIR DAMPER — Verify the position of the OA damper is fully closed off to outdoor air when the unit is off or unoccupied. Using the Network Service Tool, page down to the bottom of the Status Display screen and select the MIXED AIR DAMPER 2 output. Force the output to OFF. Next, select the MIXED AIR DAMPER 1 output and force this output ON. Verify the dampers begin to open to outdoor air while closing off the return air damper. Allow the dampers to fully open and check to ensure the outdoor-air damper reaches its full open position and does not stick or bind. After the damper has stopped opening, disconnect power to the controller by setting the control to OFF. Verify the spring return feature fully opens the return air damper while the outdoor-air damper fully closes. Return the control switch to CONT and wait for the damper to again fully open to the outdoor air.

After the outdoor-air damper is fully open, select the MIXED AIR DAMPER 2 output and force it to ON. The force placed earlier on the MIXED AIR DAMPER 1 output should be removed automatically. The outdoor-air dampers should begin to close while the return air damper begins to open. After the outdoor-air dampers fully close, remove any forces from the two outputs.

Fan Tests — The Unit Ventilator Comfort Control module provides a fan relay output which starts and stops the fan when the control switch is in the AUTO position. A three-speed output control is used to switch the fan from LOW speed to MEDIUM or HIGH speed as required by the load.

FAN RELAY OUTPUT — Set the control switch to the AUTO position and using the Network Service Tool, select the Status Display screen and verify the FAN STATUS and FAN RELAY both read OFF. Set the control switch to the AUTO position. Select the FAN RELAY and force the point to ON. Verify the fan starts and the FAN STATUS changes within 10 seconds. Reselect the FAN RELAY and force the point to OFF. Verify the fan stops and the fan status changes to OFF. Remove any force applied.

THREE-SPEED FAN — To verify proper operation of the fan speed control, the unit must be in the Unoccupied mode. With the fan stopped, set the control switch to the CONT position. Verify the fan operates at low speed. Using the Network Service Tool, page down through the Maintenance screen and locate the FAN SPEED RELAY 1 point. Force the FAN SPEED RELAY 1 output to ON. Verify the fan speed increases to MEDIUM. Select the FAN SPEED RELAY 2 output and force this point to ON. Verify the fan speed increases to HIGH. Remove any forces from FAN SPEED RELAY 1 and FAN SPEED RELAY 2.

FAN STATUS — Set the control switch in the OFF position. Using the Network Service Tool, select the Points Display screen and verify the Supply Fan Status reads OFF. Set the control switch to the CONT position and verify the fan is operating. Verify the Supply Fan Status reads ON.

Filter Maintenance — For units connected to a CCN system, a dirty filter alarm is generated and reported as soon as the operating hours of the unit exceed the configured filter maintenance interval. This is a software function of the controller and does not require any testing.

To reset the alarm after the filters have been serviced, use the Network Service Tool and select the filter status from the Status Display screen. Force the point to CLEAN. After waiting 10 seconds, remove the force using the AUTO command. This will reset the timer and reset the displayed value to CLEAN.

Remote Start Input — Set the control switch to the OFF position and using the Network Service Tool, select the Status Display screen and verify the FAN STATUS and FAN RELAY both read OFF. Set the control switch to the AUTO position. Using a jumper wire, temporarily jumper terminals TB to T20 of the control board. Verify the FAN RELAY reads ON, the fan starts and the FAN STATUS changes from OFF. From the Status Display screen, determine the operating MODE. Remove the jumper. If the operating mode previously was cooling, the MODE will change to FAN ONLY as soon as the jumper is removed. The fan will continue to operate for 5 minutes. For all other modes, the fan should stop within 5 seconds after the jumper is removed.

Sensors

AIR QUALITY SENSOR OPTION — Using the Network Service Tool, select the Status Display screen and verify the Air Quality (CO_2 sensor) reads at least 300 ppm. Verify the sensor is configured for a 2 to 10 vdc output over a 0 to 2000 ppm sensing range. The hardware jumper inside the sensor near the terminal connection block must also be installed in the proper position for a voltage output. Any further sensor checkout requires the use of the User Interface Program and a calibration gas to provide an accurate verification. Refer to the instructions provided in the calibration gas kit and the User Interface Program for operation of these items.

HUMIDITY SENSOR OPTION — Using the Network Service Tool, select the Status display screen and verify the Relative Humidity reads the proper value. Be sure the local RH sensor decision in the CCN Configuration table has been set to YES. The 499-ohm resistor, which has been factory-supplied with the sensor, must also be correctly installed. Use a sling psychrometer or local humidity sensor to verify the sensor is reading properly.

Fire Shutdown Option — Using the Network Service Tool, select the Status display screen and verify the Fire Shutdown status reads NORMAL when the local smoke or fire detector is in the normal state. Set the control switch to the AUTO position, and force the FAN RELAY output ON. Verify the fan start and the FAN STATUS reads ON. Trip the local smoke detector or fire detector and verify the Fire Shutdown input reads ALARM, the supply fan immediately stops, and the FAN STATUS reads OFF. Place the control switch in the CONT position and verify the supply fan remains off. Reset the smoke or fire detector and verify the supply fan restarts. Remove all previous forces and set the control switch back to the OFF position.

Electric Heat and Direct Expansion Cooling — Electric heat and direct expansion cooling control functions utilize both mechanical and software integrated safeties which prevent the testing of these functions independently of the equipment operation. These require that the equipment be operating in order to prevent equipment damage. All previous testing must be completed prior to performing any DX and electric heat tests.

ELECTRIC HEAT — Set the control switch to the OFF position. Using the Network Service Tool, select the Status Display screen and verify the FAN STATUS and FAN RELAY both read OFF. Verify a controlling temperature of 85 F or less. If not, force the value to 70 F. Set the control switch to the AUTO position. Select the Remote Start point and force the point to ON. Verify the fan starts and the FAN STATUS changes. Select the Set Point screen and increase the Occupied Switch Set

Point to 90 F. Select the Points Display screen and verify the Heating 1 output reads ON. If two stages are used, verify the second stage is set to ON within two minutes. Verify both electric heat control relays are energized. Verify the electric heater stage(s) are enabled and that the supply-air temperature increases. Select the Set Point screen and return the set points to their original values. Reselect the Remote Start input and set the point to AUTO. Verify the supply fan stops and the Fan Status changes to OFF. Reselect the Controlling Temperature point and AUTO this point if it had previously been forced.

DIRECT EXPANSION COOLING — Set the control switch to the OFF position and the condensing unit disconnect to OFF. Using the Network Service Tool, select the Points Display screen and verify the FAN STATUS and FAN RELAY both read OFF. Verify the Controlling Temperature is greater than 55 F. If not, force the value to 70 F. Set the control switch to the AUTO position. Select the Remote Start point and force the points to ON. Verify the fan starts and the FAN STATUS changes. Select the Set Point screen and decrease the Occupied Heating Set point to 40 F and decrease the Occupied Cooling set point to 45 F. Verify the outdoor-air temperature reads above the configured DX Outdoor Air Lockout value. If not, force the Outside-Air Temperature to 90 F. Select the Points Display screen and verify the Cooling 1 output reads ON. If two stages are used, verify the second stage is set to ON within 2 minutes. Verify both accessory relays are energized. Set the condensing unit disconnect to ON. Verify the DX cooling stage(s) are enabled and that the supply-air temperature decreases. Allow the unit to operate for 2 minutes minimum. Select the Set Point screen and return the set points back to their original values. Reselect the Remote Start input and AUTO the point. Verify the mode changes to Fan Only. Reselect the Controlling Temperature point and AUTO this point if it had previously been forced. Reselect the Outside-Air Temperature point and AUTO this point if it had previously been forced. Allow the fan to operate to evaporate the condensate from the coil. The supply fan will stop automatically after approximately 5 minutes.

Mixed-Air Damper Sensor Final Calibration — The mixed-air damper control uses a temperature difference method to maintain the minimum outdoor-air ventilation. For this reason, it is important that the sensors be calibrated to ensure that the desired quantity of outdoor air is provided at any operating speed.

> IMPORTANT: The Comfort Controller requires that each unit be equipped with its own outdoor-air sensor installed for mixing box applications. A broadcasted OAT value from a single location will not ensure that the outdoor-air temperature is being correctly measured for an individual unit.

To perform a final calibration for the sensors:

1. Set the control switch to the OFF position and using the Network Service Tool, select the Display screen and verify the FAN STATUS and FAN RELAY both read OFF.
2. Set the control switch to the CONT position.
3. Using the Network Service Tool, page down to the bottom of the Points Display screen and select the MIXED-AIR DAMPER 2 OUTPUT. Force the output to OFF.
4. Next, select the MIXED-AIR DAMPER 1 output and force this output ON. Wait for the dampers to fully open to outdoor air while closing off the return-air damper. Allow the unit to operate for 5 minutes after the OA damper reaches its fully open position.
5. Verify the mixed-air temperature is within 0.3° F of the outdoor-air temperature value. Using the OAT (Fig. 24) function, adjust the Outdoor-Air Value so that both sensors read the same relative temperature. (The values should have been previously verified for accuracy earlier.)
6. Select the MIXED AIR DAMPER 2 output and force it to ON. The force placed earlier on the MIXED-AIR DAMPER 1 output should be removed automatically and the OA dampers should begin to close while the return-air damper begins to open.
7. After the OA dampers fully close, allow the unit to operate for 5 minutes. Verify the return-air temperature is within 0.3° F of the mixed-air temperature reading. If not, adjust the return-air temperature reading using the OAT (Fig. 24) function so that both sensors read the same temperature. (The value of the mixed-air temperature and outdoor-air temperature were previously trimmed and should not be readjusted.)
8. Reselect the FAN RELAY and force the point to OFF. Verify the fan stops and the FAN STATUS changes to OFF. Remove the forces previously placed on the MIXED-AIR DAMPER 1 and 2 outputs.

Testing Completion — After all checkout and testing has been completed, set the controller time by using the Building Time feature of the Network Service Tool (do NOT use the Controller Time Function). After disconnecting from the unit, CYCLE THE UNIT POWER to reset the valve and damper positions and restore automatic control. Although the Unit Ventilator Comfort Control module will not respond, the controller will begin to maintain a software clock so that any Network Alarm message will contain the correct time and date stamp.

Additionally, the database for each control should be stored on a 3.5 in. computer disk for future service use. The CCN Network Service provides an Export function for this. Refer to the Service Tool operating instructions for further information. The database disk will provide an easy method of reprogramming a control board should it ever become necessary to replace it. All the control configuration, set points, sensor trim information, and controller addressing information is stored for easy downloading into a replacement control board assembly.

Unit Diagnostics and Troubleshooting — See Table 30 for 40UV,UH diagnostics and troubleshooting information.

Table 30 — Unit Diagnostics And Troubleshooting

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
Unit Does Not Operate	Power to control is OFF	Check local disconnect or circuit breaker.
	Remote Start/Stop (S/S) jumper not installed (for stand-alone operation only)	Install jumper between T20 on control module and TB (24 vac).
	Faulty connections	Check LED on control board. If not flashing at a 1-second rate, check for loose connections and 24 vac on POWER connector.
	Control switch is in OFF position or safety controls are tripped	Verify control switch is in the AUTO or CONT position. Check for a tripped LLT.
	Smoke or fire detector is tripped, detector wiring shorted	Check the status of the Fire Shutdown input. Determine cause of detector trip and correct if necessary. Check for shorted wiring and correct if necessary.
No Heating	Heating is forced disabled	Verify no forces are present in the Heating 1, Heating 2 or Heating Enable outputs; remove if necessary.
	No hot water/steam/electricity	Check source and correct any problems.
	Electric heater safety tripped	Determine cause for safety trip, typically insufficient air-flow. Correct condition and reset safety switch in heater control box.
	Configuration error	Verify the control is configured properly for the type of heat used.
	No power to valve or relays	Check for 24 vac at water valve. If no power, check for open wiring.
	End switch improperly set (on Face and Bypass units only)	Refer to Face and Bypass Damper testing to verify proper operation of end switch and water valves.
	Incorrect sensor reading	Verify the temperature sensors are reading the correct temperatures.
	No fan status	Verify the Fan Status reads ON. Fan Status must read ON for heat to operate.
No Cooling	Cooling is forced disabled	Verify no forces are present in the Cooling 1, Cooling 2 or Heating Enable outputs; remove if necessary.
	No chilled water/electricity	Check source and correct any problems.
	Condensing unit safety tripped	Determine cause for safety trip, correct condition and reset safety switch in condensing unit control box.
	Configuration error	Verify the control is configured properly for the type of cooling used.
	No power to valve or relays	Check for 24 vac at water valve. If no power, check for open wiring.
	Outdoor air temperature below DX outdoor air lock-out	Verify DX Outdoor Air Lockout is correctly set to the mini-mum recommended condensing unit operating tempera-ture. Verify OAT sensor is reading correctly.
	End switch improperly set (on Face and Bypass units only)	Refer to Face and Bypass Damper Tests to verify proper operation of end switch and water valves.
	Incorrect sensor reading	Verify the temperature sensors are reading the correct temperatures.
	No fan status	Verify the Fan Status reads ON. Fan Status must read ON for cooling to operate.
Overheating	Heat outputs are forced	Verify no forces are present on the Heating 1 or Heating 2 outputs. Remove if necessary.
	Configuration error	Verify the control is configured properly for the type of heating used.
Overcooling	Cooling outputs are forced	Verify no forces are present on the Cooling 1 or Cooling 2 outputs. Remove if necessary.
	Configuration error	Verify the control is configured properly for the type of cooling used.
Mixed Air Damper Will Not Operate	Dampers are forced	Verify no forces are present on the MIX1 or MIX2 outputs. Remove if necessary.
	No power to actuator	Check for 24 vac. If no power, check for open wiring.
	Configuration error	Verify the control is properly configured for modulating type OA damper.
	Failed sensor (shortened or open)	Verify the temperature sensors are reading correctly. Replace any bad sensor.
	No fan status	Verify the Fan Status reads ON. Fan Status must read ON for dampers to operate.
Damper Fails to Operate Properly at Minimum Position	Incorrectly calibrated sensors	Verify sensors are properly calibrated (refer to the test section and repeat the calibration procedure). Verify no forces are present on MAT, OAT, or SPT.
Temperature Sensor Not Reading Correctly	Loose connections	Verify all sensor lead connections are securely fastened.
	Sensor out of calibration	Recheck each sensor reading using a digital thermometer as a reference. Reset the TRIM value to zero before test-ing each sensor (OAT, MAT, and RAT/SPT). Replace any sensor requiring more than 5 degrees of correction.

Table 30 — Unit Diagnostics and Troubleshooting (cont)

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
Indoor Air Quality (IAQ) Features Malfunctioning	IAQ not enabled	Enable IAQ control operation.
	Set point too high/too low	Adjust the set point to the correct value.
	Space or return air temperature too high/low	Control will resume when space/returns temperatures recover.
	Space Relative Humidity too high	Control will resume when relative humidity recovers. Verify high humidity limit is configured properly. Reset to 100% if RH control is not used.
	MAT sensor is shorted, open, or forced	Normal operation will resume when MAT sensor is operating properly. Remove Force; repair or replace MAT sensor.
LLT Trips Frequently	LLT switch malfunctioning	Replace LLT switch.
	MAT sensor failed or out of calibration	Verify MAT sensor is reading correctly. Trim or replace if necessary.
IAQ Level Exceeds Set Point Frequently (Generated Alarms)	Maximum output value set too low	Verify maximum output value has been correctly set. Increase value in 10% increments.
	OAT sensor failed or open	Normal operation will resume when OAT sensor is repaired.

LEGEND

DX — Direct Expansion
IAQ — Indoor Air Quality
LED — Light Emitting Diode
LLT — Low-Limit Thermostat
MAT — Mixed-Air Temperature Sensor
MIX1 — Mixed Air 1Terminal
MIX2 — Mixed Air 2 Terminal
OA — Outdoor Air
OAT — Outdoor-Air Temperature Sensor
RH — Relative Humidity
RAT — Return-Air Temperature
SPT — Space Temperature Sensor
TB — Terminal Box

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